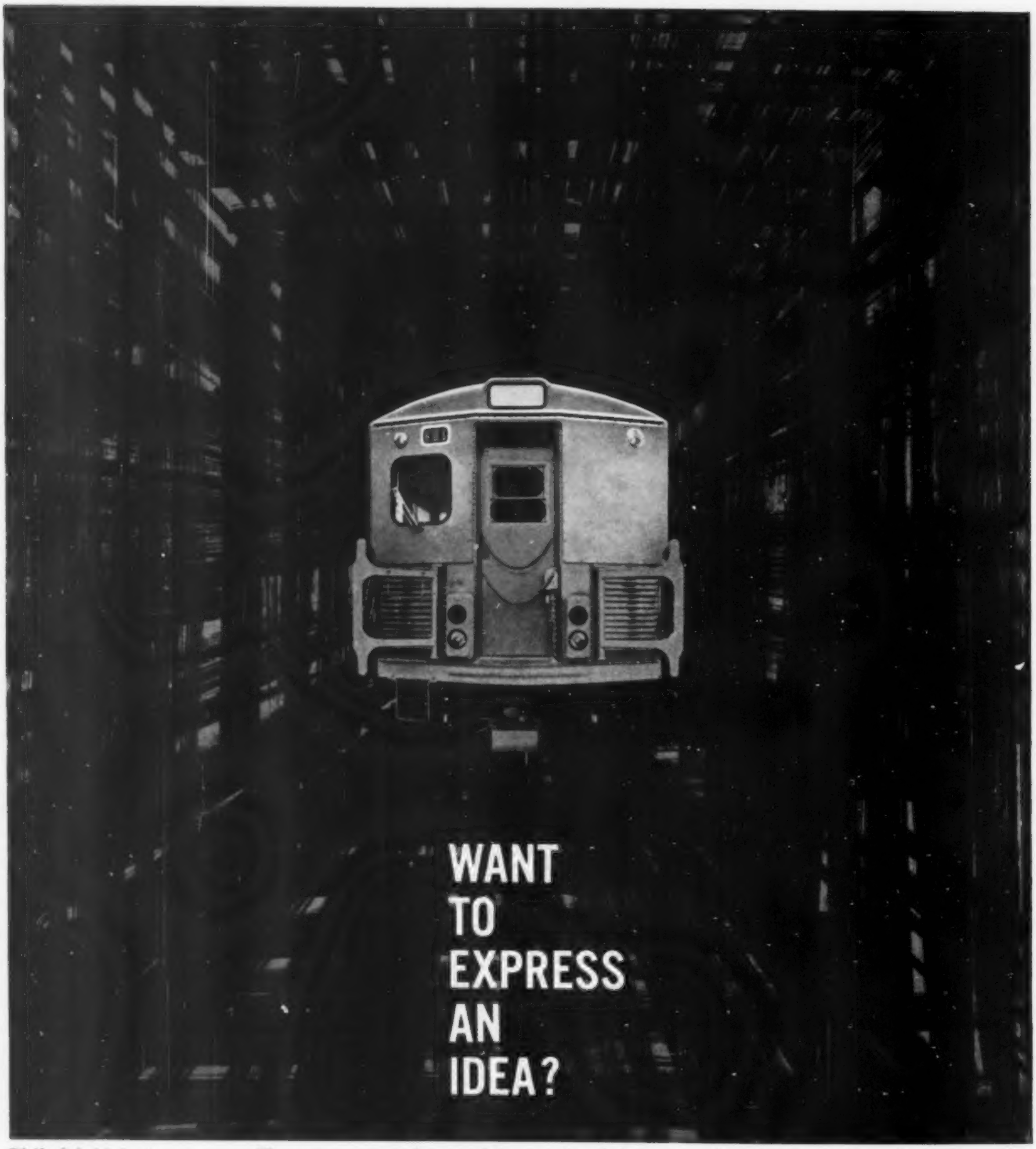
MODERN PLASTICS

NOVEMBER 1961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A MESSAGE OF IMPORTANCE TO ALL OF OUR FRIENDS IN THE INDUSTRY

From its original plant in Fords, New Jersey, Catalin has taken three giant strides. A production facility at Calumet City, Illinois, reached the great Midwestern area. Later a manufacturing unit in Thomasville, North Carolina, covered the industrial South. Now, through the acquisition of Lebec Chemical Corporation, in Paramount, California, Catalin is able to give unsurpassed service to users of industrial resins in another important production area of the country.

The Lebec Division of Catalin Corporation of America manufactures a line of resins compatible with the comprehensive Catalin range of urea, phenolic, cresylic, resorcinol, melamine and acrylic resin formulations. Founded ten years ago, Lebec has been in successful operation on a four-acre site with a railroad siding, highway access, abundant water supply and all other necessary utilities. The consolidation enables the Lebec Division, profiting by Catalin's research and development laboratories and its excellent capital structure, to forge ahead still faster in a program of furnishing the highest quality of industrial resins expeditiously and economically to customers in the rapidly growing California manufacturing area.

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MODERN PLASTICS

Volume 39, Number 3 November 1961

• Coming up . . .

Latest developments in and markets for methacrylate polymers and copolymers will be presented in our December lead article . . . Conclusion of our three-part series on polypropylene, this one dealing with film and sheeting . . . Advances in plastics for electrical applications in the 1962 cars . . . Engineering: Surface treatment of acetal . . . Technical: Effects of static pressure on melt viscosities.

In January: *our annual review issue—in an improved new format. This issue will offer a penetrating analysis of plastics performance in 1961 and forecast trends for 1962. Emphasis will be on markets and applications.*

Our annual reviews of technical progress and literature and our analysis of trends in machinery design and in processing will get extended coverage in the February issue. And to permit more complete and accurate tabulation of data on plastics processing equipment, 1961 sales figures for such equipment will be reported in the March issue.

Modern Plastics Executive and Editorial Offices: 770 Lexington Ave., New York 21, N.Y. Please mail all correspondence, change of address notices, subscriptions orders, etc., to above address. Quotations on bulk reprints of articles appearing in this issue are available on request.

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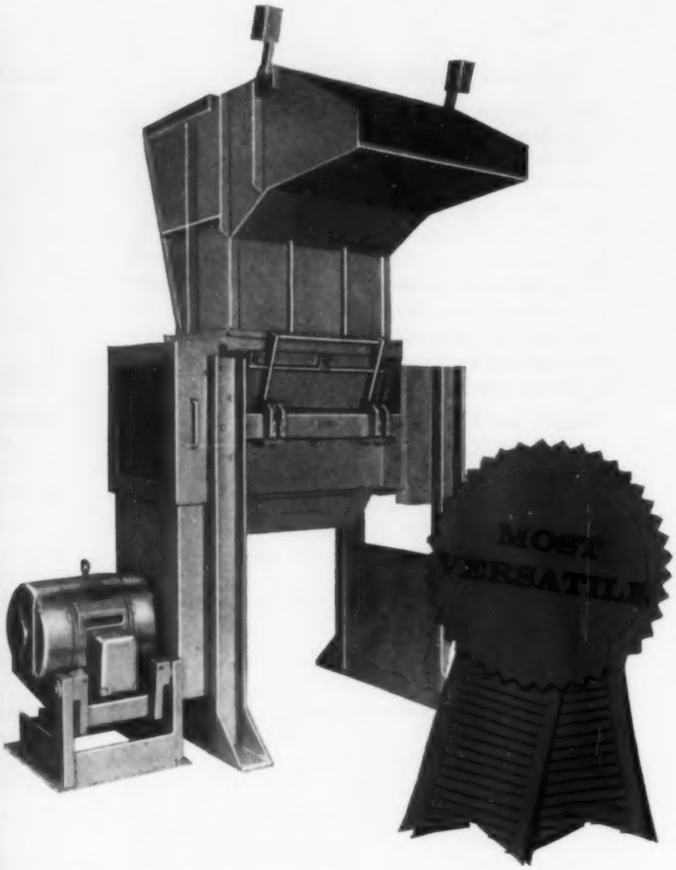

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Most Versatile Granulators Built!

Handle everything from film to large injection molded sections and purgings

The Cumberland Series B is the most flexible line of granulators available. The open type rotors with extra large cutting circles handle a wide range of materials and shapes — such as polyethylene film and purgings, blow molded bottles, carboys, parisons, deep draw vacuum formed parts and large injection molded sections.

Pre-sawing is just about eliminated and high capacity is assured. Rotors are of high alloy steel and are heat treated to withstand severe service. Doors drop down for easy cleaning without removing hopper. Screens are end removable for quick change.

Remember, all Cumberland machines are sold and serviced by Cumberland personnel.

273-1

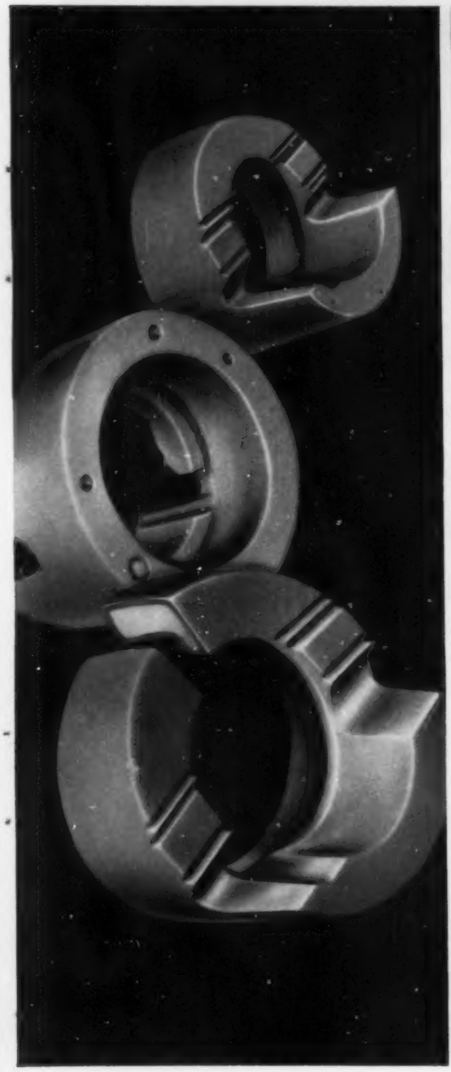
Look what you can do with Geon

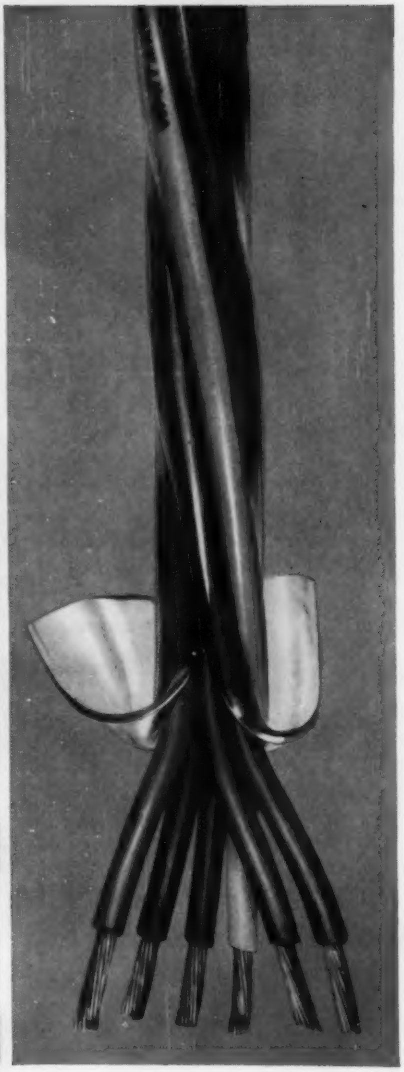
DIP IT. The maker of this water demineralizer did—discovered a low cost, simple way of getting a thick, tough, abrasion-resistant shell that is not affected by the acids and alkalies encountered in water treatment. Geon vinyl coatings can be applied many ways to many products—metals, textiles, papers, and others.

EXTRUDE IT. To obtain a wide variety of shapes and sizes with exceptional accuracy of detail, and exceptional properties. Corrosion-resistant. Abrasion-resistant. Colorful. Geon vinyl is ideal for molding, seals, tracks — comes in rigid form with spring-back properties or in softer form for sealing qualities.

ROTATIONALLY CAST IT. This horse is rotationally cast of Geon vinyl in one piece. Provides the right combination of durometer hardness, tensile strength, heat stability and low viscosity range. Best of all, use of Geon permits exceptional accuracy of detail and color, for true-to-life appearance.

FOR MORE INFORMATION ABOUT THESE and other ways you can use Geon vinyl to improve your product, or open new markets, write Dept. NF-10, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.





LOOKING FOR DIVERSITY IN A DIOL?

Whatever your requirements—polyesters, polyurethanes, surface active agents, polymeric plasticizers, humectants, or coupling agents—there's one diol that's a winner. That's *Celanese 1,3-Butylene Glycol.*

Despite the well-known advantages of 1,3-BG, it just wasn't economically available in commercial quantities—far from true today.

Right now, Celanese has a 25-million pound production capacity for this low cost diol! Fact is, we are the *only* company in the United States with commercial capacity for 1,3-butylene glycol.

Shouldn't you now be using this versatile 4-carbon diol? In addition to its unusual stability, 1,3-BG has a combination of two non-adjacent hydroxyl groups, which minimizes ring closure and dehydration. It's highly hygroscopic, non-toxic, and soluble in water and most organic solvents. Moreover, its longer chain length and molecular configuration open up new possibilities in many fields.

For more specific information about Celanese 1,3-Butylene Glycol, just fill out the coupon and drop it into the mail. Celanese Chemical Company, 522 Fifth Avenue, New York 36, N. Y.

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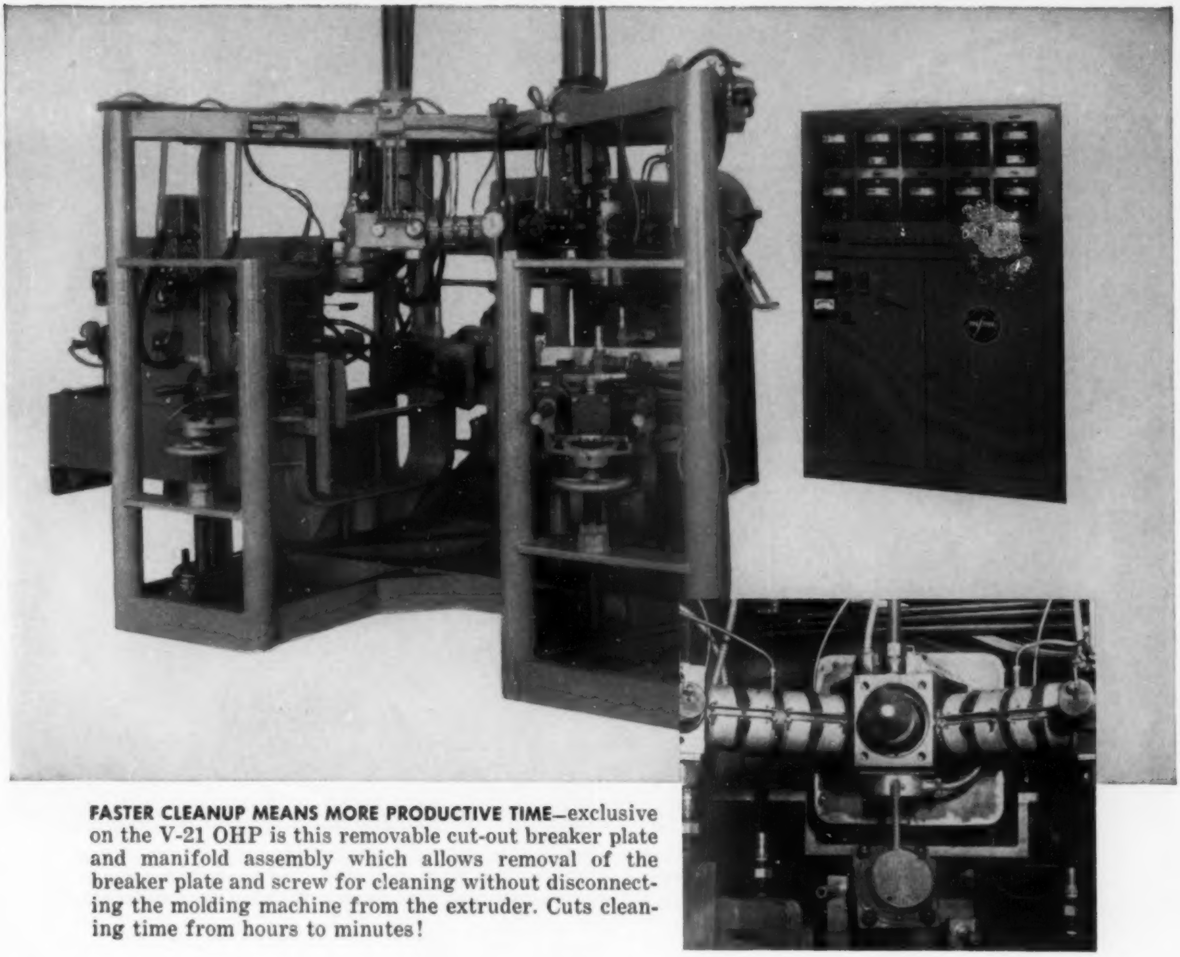

FASTER CLEANUP MEANS MORE PRODUCTIVE TIME—exclusive on the V-21 OHP is this removable cut-out breaker plate and manifold assembly which allows removal of the breaker plate and screw for cleaning without disconnecting the molding machine from the extruder. Cuts cleaning time from hours to minutes!

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V-21 OHP Diversamatic faster more versatile than ever!

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VERSATILITY FOR HIGH PERFORMANCE—Either identical or different molds can be run at the same time, making it possible for you to produce a *different* item on each of the two stations. You can use up to *four* heads on each station for even greater versatility—greater speed. Separate accumulators on each station assure you of highly accurate parison delivery.

EASY OPERATION CUTS YOUR COSTS—Diversamatic is fully automatic, being controlled electronically by a nearby console. The machine also has manual controls for fast mold set-up and test runs. It requires minimum operator supervision, and is so simple to run that it is being operated by persons having no previous experience or knowledge in the plastics field.

MPM's COMPLETE MANUFACTURING FACILITIES— no mere assembler, MPM manufactures all its components, then pilot tests the completed unit. When you choose MPM, you can arrange to see your equipment in operation before it is shipped.

Write today for full information on MPM blow molding equipment. Manufactured under U.S. Patent 2980955. Other patents pending.

mpm **Modern Plastic Machinery Corp.**

General offices and engineering laboratories: 64 Lakeview Avenue, Clifton, N. J.

Now an expanded family of PLIOVIC resins stands ready to deliver outstanding processing advantages plus unusual end-product characteristics!

Newest addition of the PLIOVIC line is PLIOVIC M-70X, a straight PVC resin. It is designed specifically as a viscosity modifier for plastisols. Resin particle size is such that a wide range of formulation latitudes is possible without induced settling.

PLIOVIC AO, the established copolymer vinyl resin, gives these advantages in dispersions: Excellent dispersing characteristics. Wide plasticizer compatibility. Good viscosity stability. Gradual gelation. Low fusing temperature. Good physical properties.

PLIOVIC WO, the straight PVC resin, assures these benefits in organosols and plastisols: Exceptional adhesion. Excellent viscosity stability. Unusual pseudoplasticity. Good heat and light stability. Low water sensitivity. Unusually low gelation and fusion temperatures. High strength and abrasion resistance.

The growing number of success stories based on PLIOVIC dispersion resins is no accident. For in any of these typical applications—plastisols and organosols for slush molding, tie-coat laminations, rotocasting, dip- and spray-coating, plastigels and plastic foam—Goodyear quality and technical help mean big dividends. For further details, including the latest *Tech Book Bulletins,* write Goodyear, Chemical Division, Dept. I-9440, Akron 16, Ohio.

Other types of PLIOVIC Resins are performance-proved . . . for better-performing products!

PLIOVIC GENERAL-PURPOSE RESINS are designed for calendering, extrusion, molding and rigid applications. A wide range of molecular weights, particle sizes and distribution, and porosities suit them to applications calling for different physical properties and processing conditions.

PLIOVIC COPOLYMER RESINS are vinyl-chloride, vinyl-acetate copolymers offering good physical properties as well as outstanding processing characteristics. Typical applications: phonograph records, rigid moldings and extrusions, flooring, rigid and flexible calendered sheeting.

PLIOVIC DRY-BLEND EXTRUSION RESINS are available in a range of molecular weights, particle sizes and porosities for extrusion from free-flowing dry-blend powders. Typical uses: primary wire insulation, cable jacketing, garden hose, tubing, clothesline, gaskets, weather stripping.

PLIOVIC COLD BLENDING RESINS offer a remarkable affinity for the plasticizer. These "blotter" resins can be premixed at room temperature to form powder blends, at a low gel level. Ideal for heavy-gauge, gel-free sheeting for outer garments, upholstery materials, swimming pools and other high plasticizer level products.

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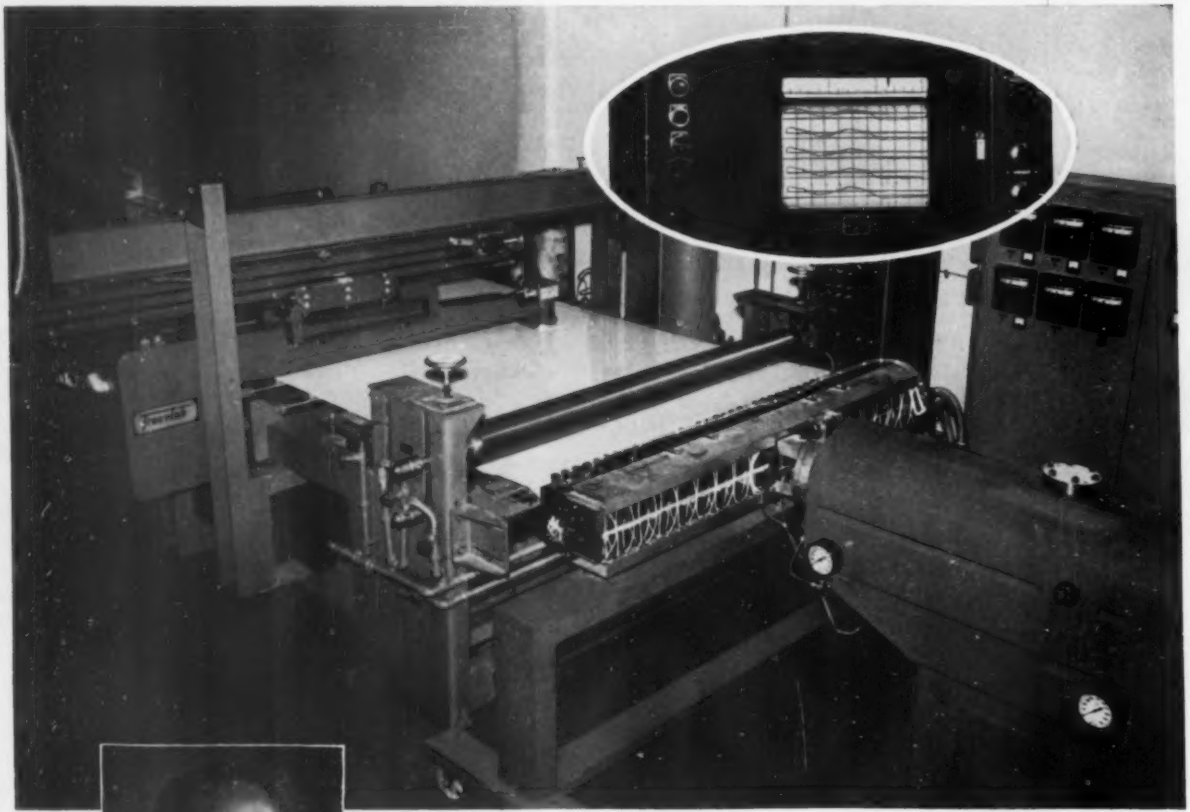

Stanley M. Chase
Cape Girardeau, Mo.

"A better acrylic sheet than ever before...thanks to a Tracerlab Automatic Profiling Beta Gauge System"

says Stanley M. Chase, President of Atlas Plastics Corporation, extruders of flat and corrugated acrylic sheet for the sign trade. Mr. Chase goes on to say: *"We extrude the world's widest acrylic sheet, yet the Tracerlab Beta Gauge Profiling System automatically enables us to control the thickness of the sheet to tolerances we never before thought possible. As a result, we produce a better product at lower cost — our customers and their customers benefit from this superb Tracerlab system."*

If you have a thickness or weight control problem, Tracerlab Automatic Process Control can help you to improve products and profits. For further information get in touch with Mr. John Wood of Tracerlab's Industrial Division.

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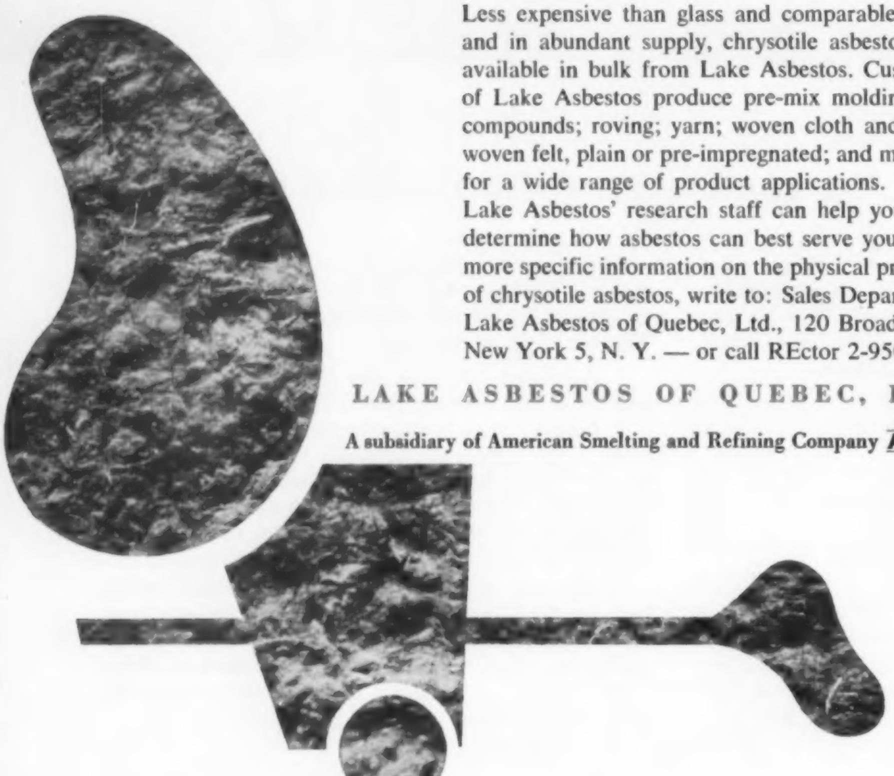

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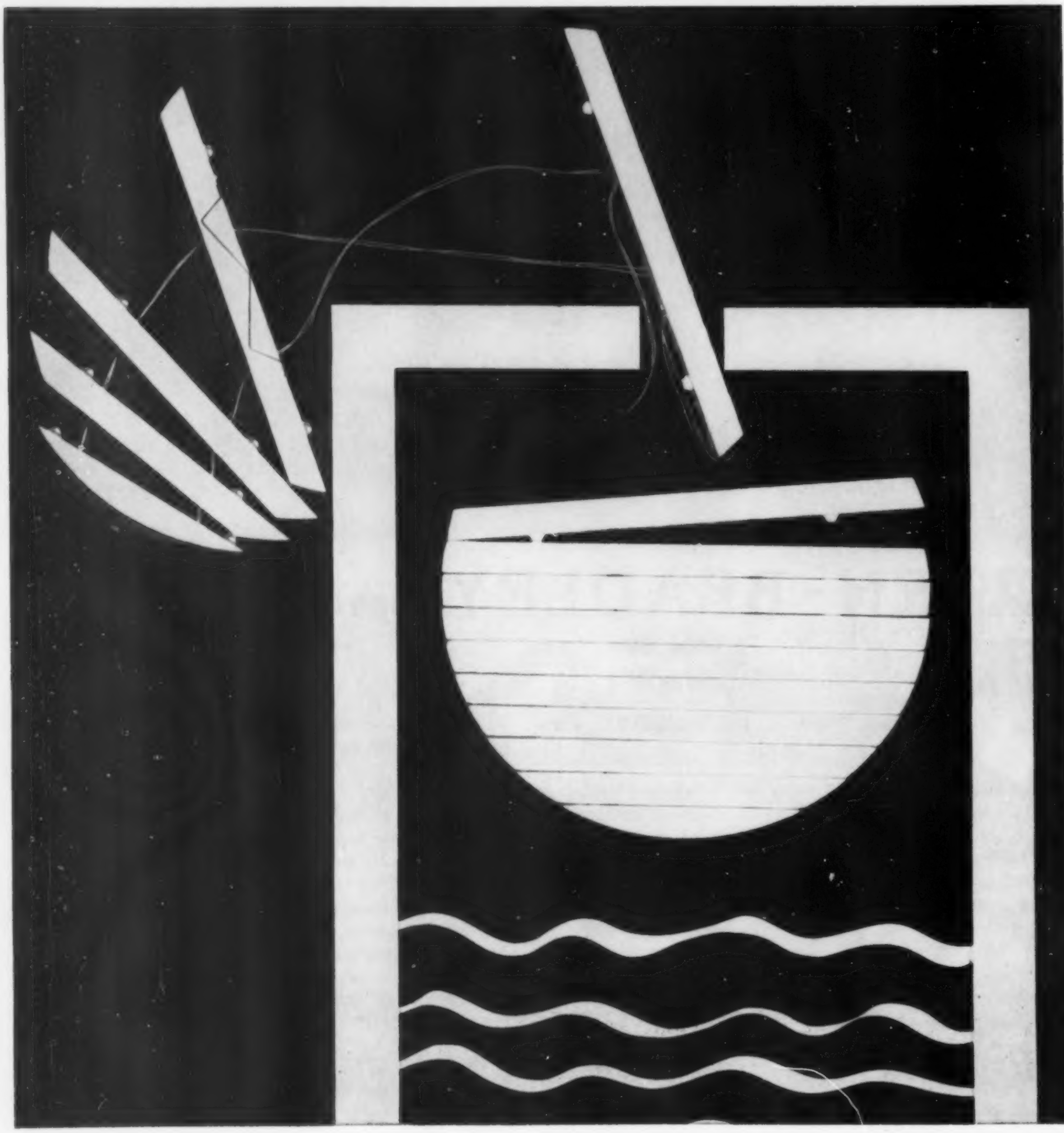
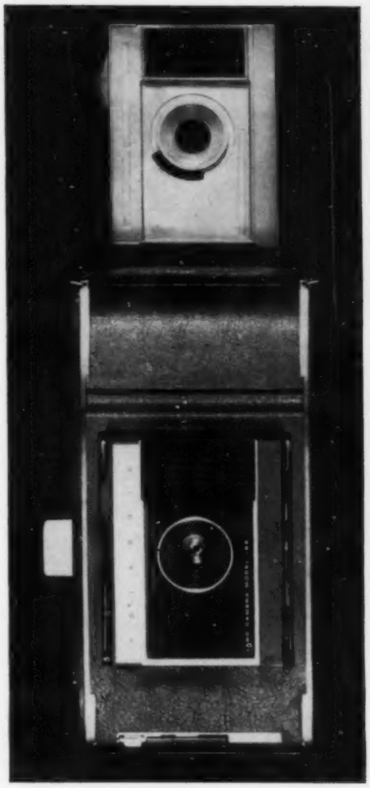
Top executives from Plastene Corporation, a subsidiary of American Thermos Products Co., witness mold tests on extruder-type injection machines in the H-P-M laboratory. In the foreground a new Model PX two-stage extruder preplasticizer; a single-stage IX model in-line extruder machine is shown in the background.

Foam plastic ends waterlogging of pressure tanks

The most common problem with home water systems has been in maintaining the right amount of air in pressure tanks. Mechanical air controls haven't done the job because water quickly corrodes their metal parts. Now, Baker Manufacturing Company of Evansville, Wisconsin, has developed the Monitor AirSaver Float molded from lightweight DYLITE® expandable polystyrene. The moisture-proof float covers the surface of the water, and ends air absorption which causes troublesome waterlogging. Even though it's half submerged in water and must constantly withstand pressures of 20 to 40 lbs. psi, the float is guaranteed for 5 years. Designed to install in minutes, the float has a series of DYLITE bars which are highly resistant to rotting, leaking, corrosion and chemical action. They are inserted, one at a time, through a hole in the top of the pressure tank. Tensioning springs lock the bars together, and make the float airtight.





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Molding New Ideas Into Plastic

Artificial Root System with Plastic Sleeve

Extends Life of Christmas Trees

Butyrate Sleeve for Halvorson Trees, Inc. by Minnesota Plastics Makes Leakproof Joint to Christmas Tree Stand, Increases Effectiveness of Feeding, Delays Needle Drop, Prolongs Freshness.

Halvorson Trees, Inc., Duluth, had a good idea—a man-made artificial root system for the Christmas trees it processes and sends all over the world.

Now they were looking for a way to make this good idea better Their first stands were built with a metal sleeve. This type of sleeve required doweling all trees to fit a standard half inch opening. Unfortunately, doweling cut off the very bark area which transported the tree's nourishment, a synthetic sap, stored in the base of the stand. Then Halvorson got in touch with Minnesota Plastics. The idea now was to make a strong, flexible sleeve with sufficient elasticity to accommodate trees of varying diameters.

After experimenting with various materials and prototypes, Minnesota Plastics settled on the Butyrate sleeve you see above as the ideal solution. Reports Roy E. Halvorson, president of the Duluth firm: "Since adopting the new sleeve, we have virtually eliminated claims based on premature shedding of needles."

If you, too, are looking to plastics as a way to make your present product better or a new product best, then a good first step is a letter or telegram to Minnesota Plastics.

First step in assembly is insertion into metal stand. Sleeve makes liquid-proof bond against locking lip. Next, two nozzles automatically fill stand with water and specially developed nutrients.

On production line, upper ¾" of sleeve is heated and tree stem inserted. At same instant, stem and sleeve are sealed together by special machine.

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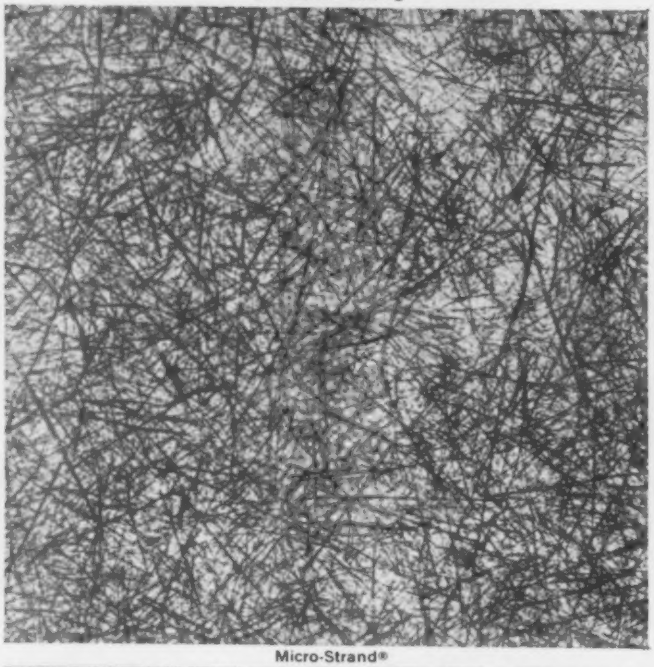

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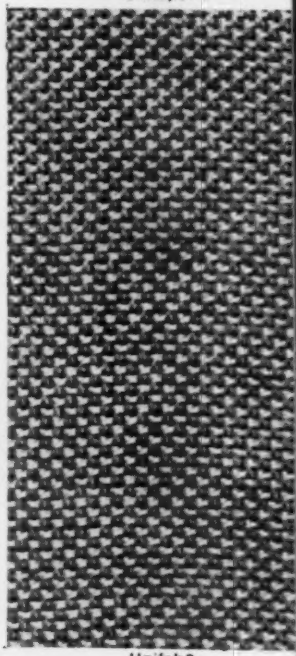

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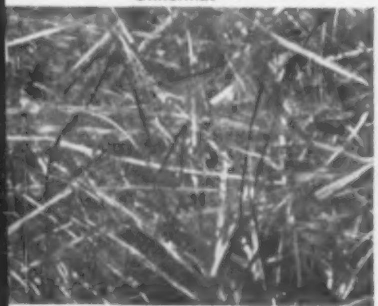
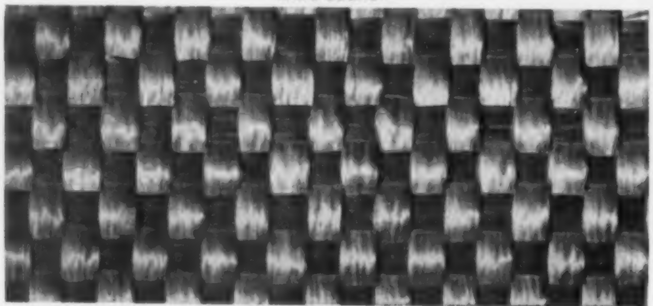


Chopped Strand



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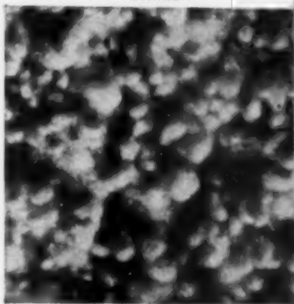

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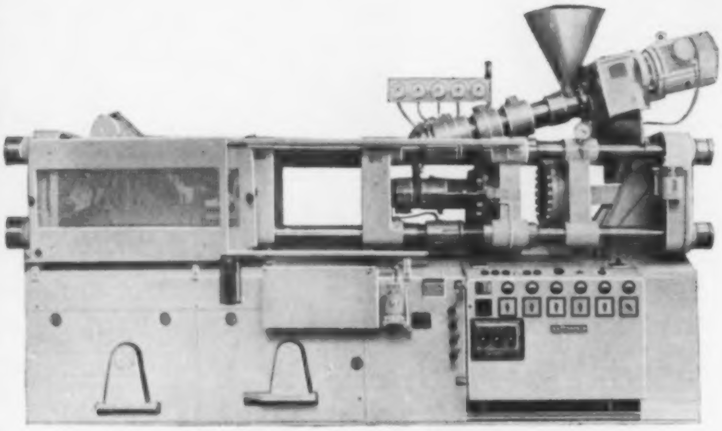

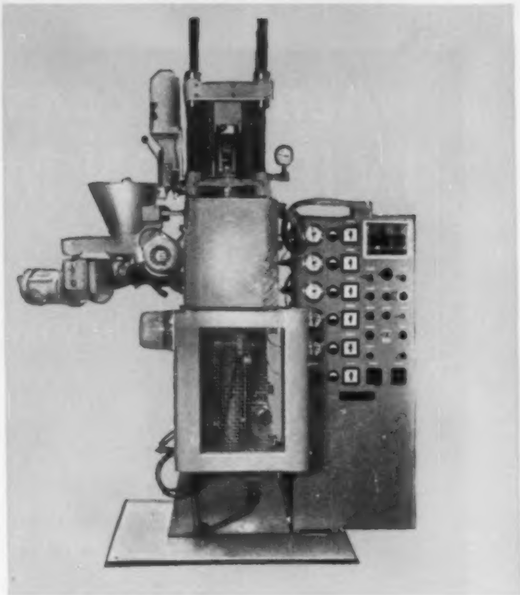

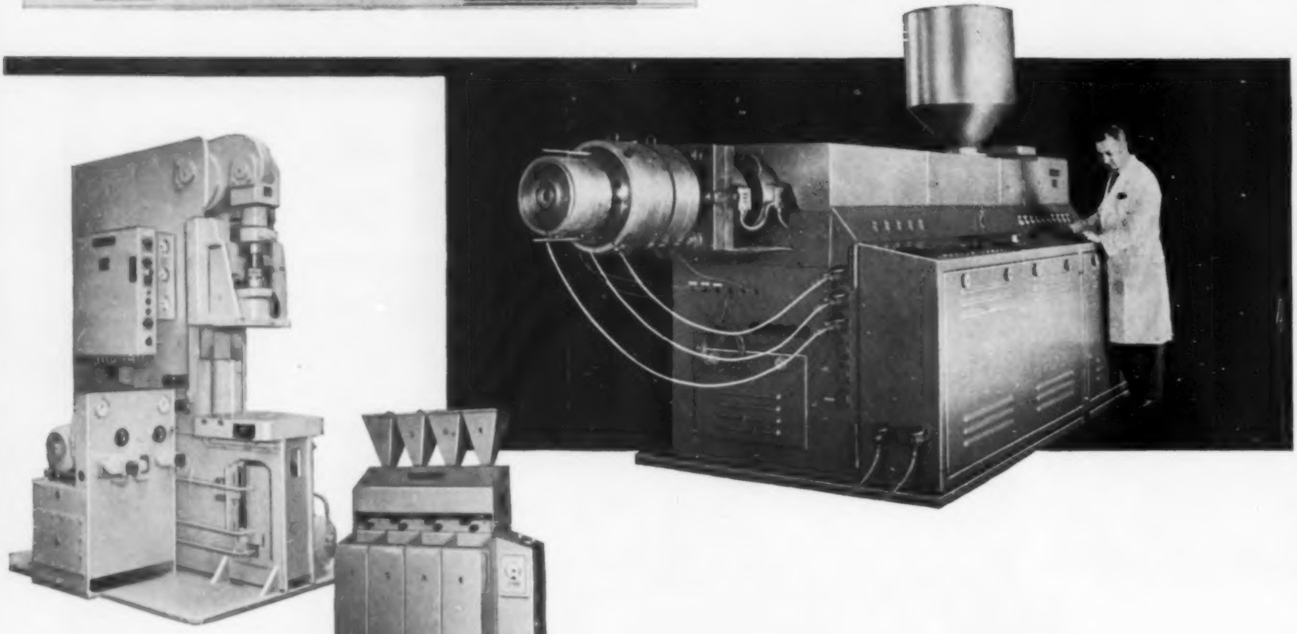

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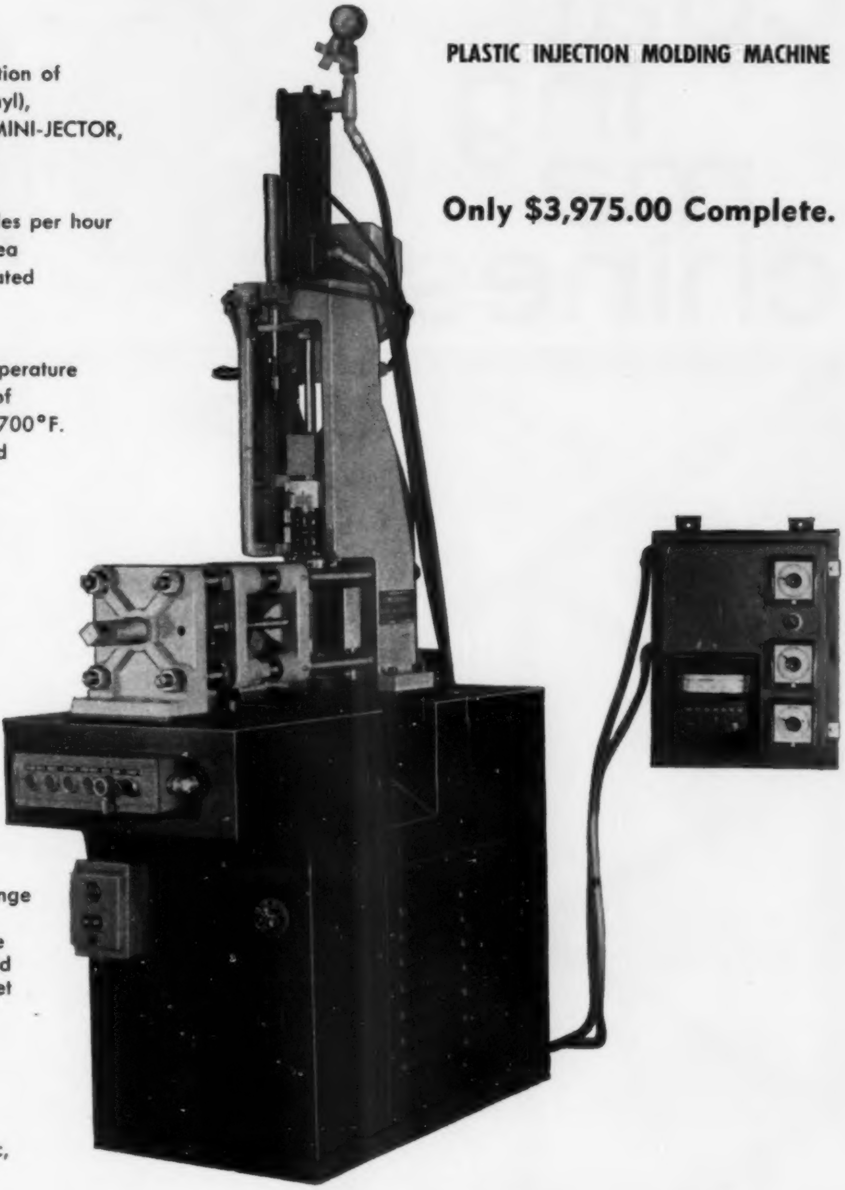

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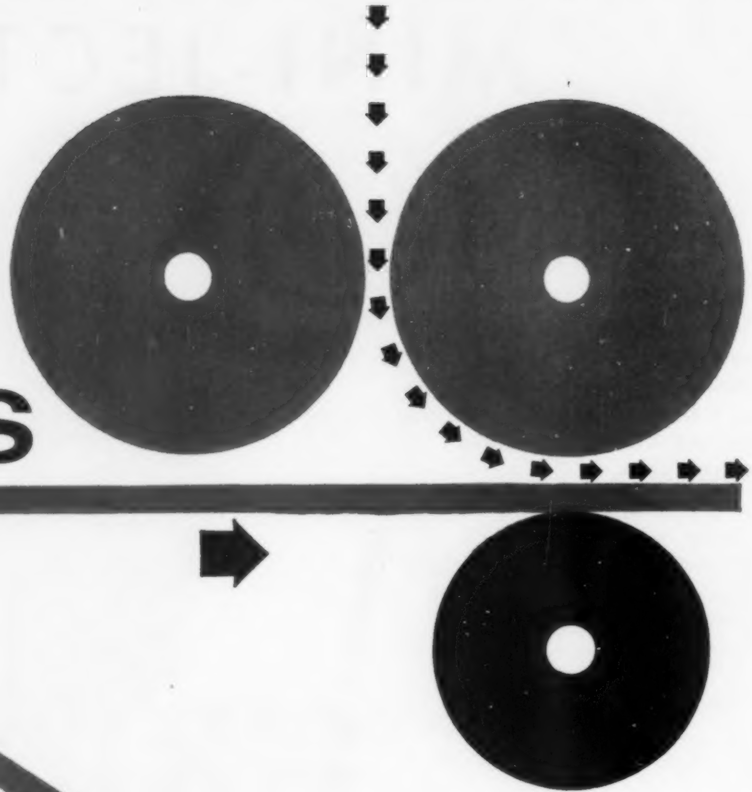

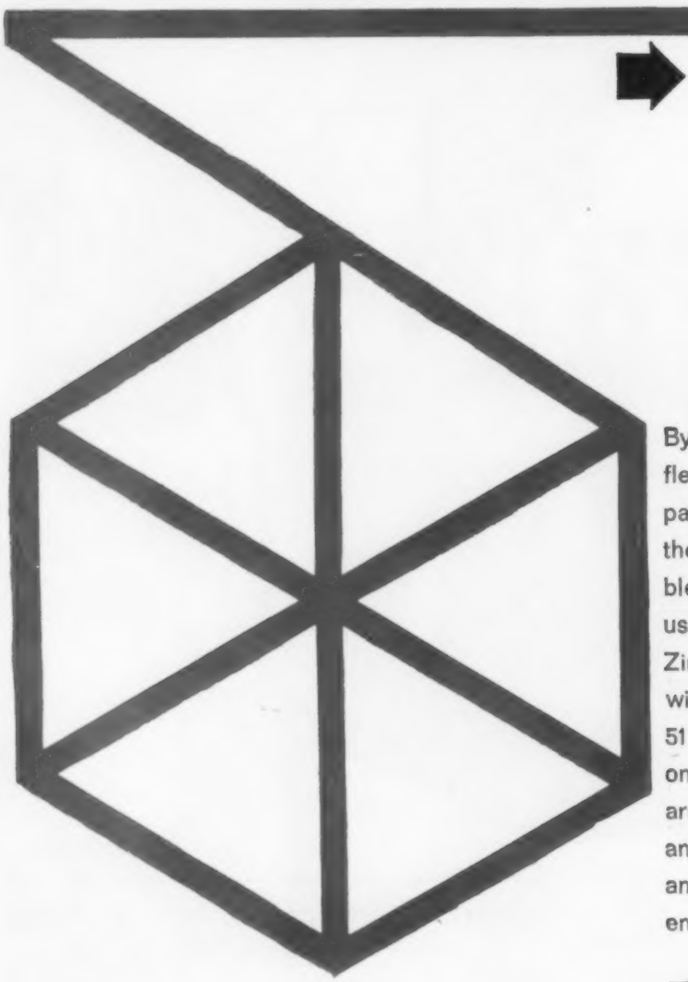

By the well-known Zimmer Melt Roll Process, flexible base materials such as textiles, paper, aluminium foil, etc. can be coated with thermoplastics in the form of pellets, dry blend or paste in a single operation without the use of bonding agents.
Zimmer Machines are offered in four coating widths, ranging from 320-1300 mm. (12¾" - 51"), all of which are working successfully on a variety of products, all over the world. They are simple to service and economical to operate and combine versatility with modest space and power requirements. Low production costs ensure a high return for the invested capital.

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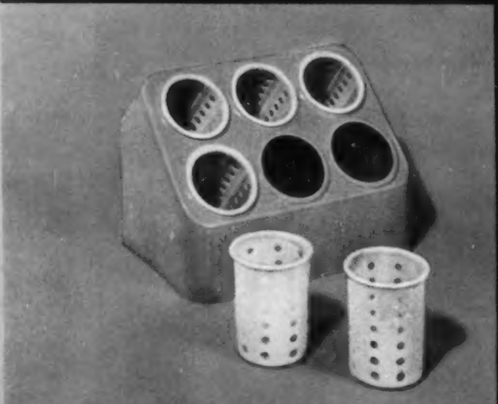
DEGREASING BOX (W. D. Adam Co., Los Angeles)—Rugged, light, and durable. Unaffected in normal cleaning with degreasers like Trichloroethylene . . . won't corrode.

INPLANT STORAGE (Como Plastics, Columbus, Ind.)—Designed for food industry . . . injection molded, 18-gal. container that's easily washed and easily sterilized.

MILK CASE (St. Regis Paper, Panelyte Div., N.Y.C.)—Weighs only 4¾ pounds; tough and durable, non-absorbent, and odor free . . . designed for safe stacking.



CUTLERY CANISTER (Bloomfield Industries, Chicago)—Lightweight, and unaffected by harsh detergents and boiling water. Shown with counter holder also made of MARLEX.

Tote . . . ship . . . store . . . trust MARLEX* to do the job better!

Today, an increasing number of special and multi-purpose tote boxes, storage and shipping cases, containers, and the like are being made of MARLEX. This versatile, high density plastic offers outstanding performance at low cost for these applications in every walk of industry and commerce—light and heavy manufacturing, food processing, hospitals, transportation, wholesale and retail delivery.

Producing these items from MARLEX high density polyethylenes or ethylene copolymers is also economical—they can be injection molded, thermoformed, blow molded, or fabricated from stock. Moreover, this tough and durable plastic is lightweight . . . resistant to acids, alkalies, oil, greases, biological rot and corrosion. It withstands temperatures from –180°F to 250°F and can be steam sterilized. It is non-allergenic . . . dent-proof, crack resistant, and virtually indestructible. For further details on MARLEX, contact the nearest office listed below.

*MARLEX is a trademark for Phillips family of olefin polymers.

GALLON CONTAINER (Industrial Plastics, Blue Springs, Mo.)—For thousands of industrial and commercial uses . . . from syrup to acid. Lightweight, unbreakable, and shippable.

RE-USABLE SHIPPING CONTAINER (Thermo-Plastic Products, San Carlos, Calif.)—For missile components. Here, MARLEX provides maximum protection with low weight.

PICKING BOX (Pioneer Products, Tucson, Ariz.)—Lightweight, non-absorbent, nesting and stackable . . . resists denting, won't crack. MARLEX means low cost and longer life.

PHILLIPS CHEMICAL COMPANY, Bartlesville, Oklahoma, a subsidiary of Phillips Petroleum Company

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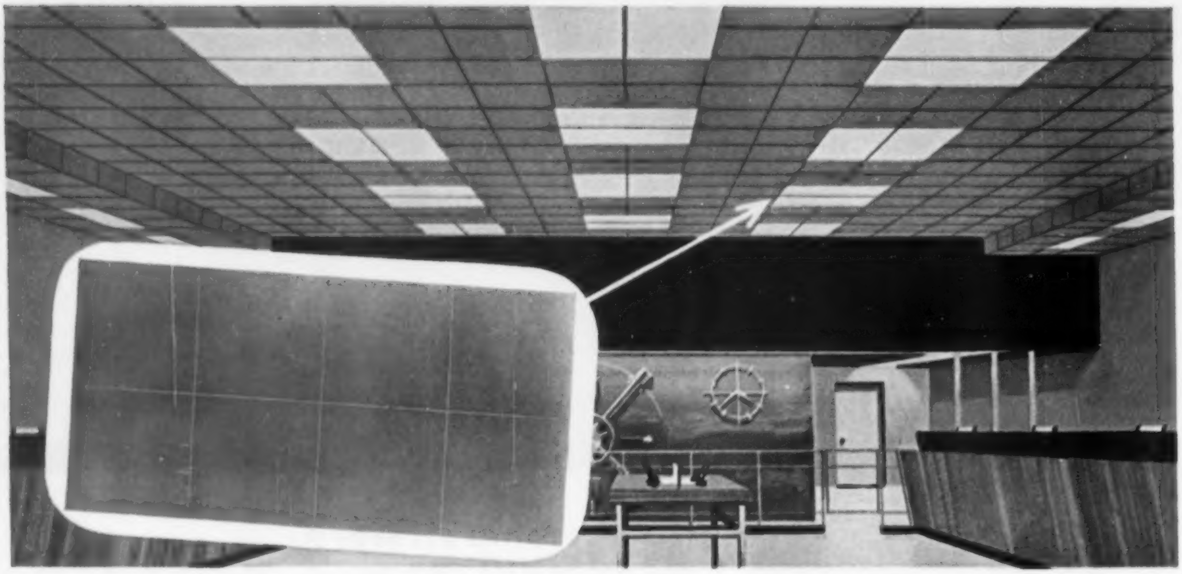
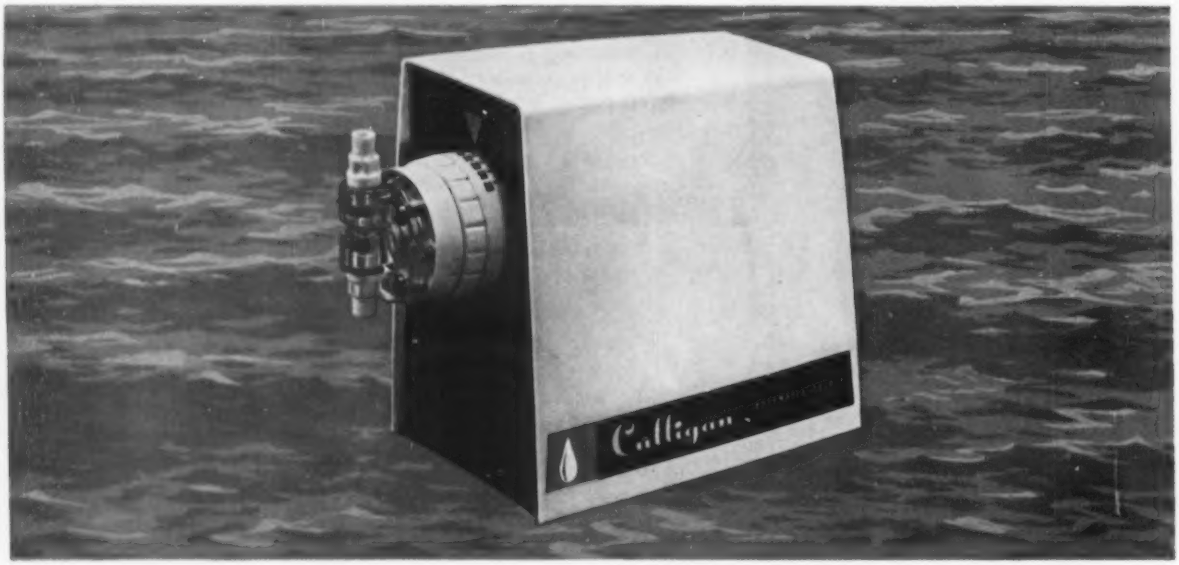


Handsome and Hardworking
Plexiglas ... Implex



The new 2′ x 4′ light-control lens shown above is injection molded of crystal-clear PLEXIGLAS® acrylic plastic. PLEXIGLAS provides the *strength ... freedom from discoloration ... full utilization of light* ... and *accurate prismatic structure* that are features of this precisely designed optical element for quality lighting.

IMPLEX® high impact acrylic is used for the one-piece housing—and 16 other molded parts—of the chemical feeder pump for a water conditioning system. IMPLEX assures *toughness ... resistance to chemicals, corrosion and stain ... dimensional stability ... resistance to wear ... attractive appearance* ... and *mechanical strength.*

Put the properties of these Rohm & Haas quality molding materials to work for your benefit. Our design staff and technical service representatives will be pleased to help.

ROHM & HAAS

PHILADELPHIA 5, PA.

In Canada: *Rohm & Haas Company of Canada, Ltd., West Hill, Ontario*

Is it time to raise prices?

The skimble-skamble now going on in the attempt to raise prices of polystyrene (PS) is illustrative of what's going on in almost the entire scope of the chemicals industry. The chemicals companies are striving to raise the profit level in an industry where poundage is increasing but earnings are generally on the decline. 'Tis said that stockholders may be interested in larger pound volume but are definitely opposed to lower profits. This is not an unusual situation in an industry where capacity is running far ahead of demand. It has been confronting plastics molders, extruders, etc., for more years than they care to remember.

At the time of going to press this price situation is far from clarified. Some producers announced that they were going to raise prices by 1¢/lb. for crystal, plus varying amounts in other classifications. Effective dates were listed all the way from Sept. 15 to Dec. 9. Perhaps good old Uncle Sam would be happy to know that there was no universal acceptance of the proposed raise.

The price for crystal PS was cut to 16.75¢ for hopper-car loads, and down to 18¢ for 20,000-lb. lots in bags, last January. It had been reduced from 21.5 cents. There was a futile attempt to immediately raise the 18¢ price to 19¢ but it was not accepted—largely because of a then-declining market and an extremely unstable situation generally known as price-cutting. Since that time the 18¢ price has been far from firm—unbelievable reports have come to this office of low prices at which molders are said to have purchased material, but they may have been quoting special prices for off-grade material. We have not seen the invoices—the only reason for printing such stuff is to point out that the price situation is in chaos.

Conflicting price changes by PS producers

The first trial balloon was sent up by Rexall on Sept. 5 when it announced that after Sept. 15 its price would be 19¢ in quantity bag-lot shipments and 17.75¢ in hopper cars. The date of effectiveness was later postponed. Dow Chemical then mailed a price list which was to have become effective Oct. 9, listing general-purpose crystal at 19¢ in bags (17.75¢ in hopper cars), medium-impact at 21¢, high-medium at 23¢, and high-impact at 27.5 cents. In each case, volume color would be 2¢ more.

Monsanto Chemical then announced that on Oct. 2 it would raise the price of volume colors by 1¢/lb., which would make them the same as the new Dow price; but Monsanto left the price of crystal, or general-purpose, at 18¢ after stating that, while a healthier economic structure was desirable, the present excess capacity and the need to broaden markets left them no choice but to maintain the 18¢ price for this material.

Other companies had various reactions. Union Carbide announced a raise of 1¢ across the board. Shell announced a 1¢ raise in general-purpose and medium-impact. Foster-Grant announced publicly that it would do nothing until the situation was clarified. Most other companies have the same attitude. The prize "wait and see" statement was that of one spokeman who said: "We have

*Reg. U.S. Pat. Off.

Humidifier CMPC-molded for lifetime service

The Aprilaire® high-capacity furnace humidifier will never have a problem from heat, rust or corrosive impurities of water. Manufactured by Research Products Corporation, it's housing is of CMPC-molded special-purpose phenolic . . . designed to permit easy accessibility for inspection and maintenance if necessary. The motor housing, drain pan and distributing pan are all integral molded-in parts of the neat, compact main housing. A bonus feature is soundproofing—helping make the unit whispering quiet.

To improve your products, or to meet one of those "difficult" manufacturing situations where a plastic is the answer—see your Chicago Molded Engineer . . . He'll have the solution for you!

Send for new brochure "Design and Purchase of Custom Molded Plastics".

CMPC

CHICAGO MOLDED PRODUCTS CORPORATION
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Chicago 51, Illinois

decided to raise the price of certain grades of polystyrene." But he didn't volunteer a date or the extent of the rise.

The cynics were much in evidence. One producer said: "What's the use—raise the price and then give a 3 instead of a 2% discount." Another said: "Let's face it! Many of the smaller and newer companies came into the polymer business because they had a big captive market. They can afford to sell their surplus below the market. They take no credit risk—give no technical service and have low overhead. It's a rough business and, furthermore, the molder may suffer more than us since we can no longer provide development and service funds."

Because of all the complications involved it is possible that many months may elapse before the PS price situation is reasonably well-stabilized. It is just a guess on this observer's part, but the day may come when some producers will abandon production of general-purpose crystal PS and concentrate on special formulations, as some of the vinyl chloride producers have been doing.

Intricacies in PS pricing

Several interesting angles stand out in the situation. Several classifications that once were the same price as general-purpose, or crystal, now sell at a premium. Thus, light-stabilized general-purpose resin is 1¢ more and one company's high-heat-resistant general-purpose is 3¢ more. Supposedly this allows a slighly better margin of profit and there are not many companies who have these formulations. The price situation in volume colored resin has been almost as chaotic as in crystal and the margin between the two will now be 2¢ or 3¢, depending upon the price list of the company that sells it.

Medium-impact prices are what one man called "no price at all." It's sold at various prices in various formulations and, furthermore, a molder frequently makes his own by blending with high- or super-high-impact.

High-impact, also the property of only a few producers, has held firm at 27.5 cents. It's a big volume, too—used mostly for refrigerators. Extra-high-impact is 35¢, but shows comparatively small volume compared with general-purpose or straight high-impact.

Dow offers improved light-stabilized PS

In the midst of all the hubbub over price and as an example of the type of research that may be discontinued if prices continue to decline, Dow Chemical has introduced a medium-impact grade of light-stabilized PS that will be marketed as Styron Verelite 374.

It is no secret that Dow has specialized in research on various types of light-stabilized material ever since PS became commercial. But the new medium-impact Verelite 374 is said to have a fine advantage in toughness that helps eliminate breakage of light fixtures during shipment and cleaning operations. Its high elongation properties allow the vacuum forming of a wide range of lighting pans. It also has good processability in extrusion and injection-molding machines. Improved weatherability also offers possibilities for use in outdoor signs having up to two years' life duration and is expected to broaden the market for light diffusers, fixtures, and grids. The price will be in the neighborhood of 22¢/lb. for natural and 26¢ for colored in 20,000-lb. quantities. This is the twenty-second PS formulation now manufactured by Dow. **(To page 45)**

ONE SHOT FOAM?

WHAT'S THE ADVANTAGE?

RESEARCH REPORT

MOL-REZ SYNTHETIC RESINS

PLEOGEN 4052

POLYETHER FOR RIGID FOAMS

Now Mol-Rez makes available, to large-volume foam users, the polyether resin component of the famous PLEOGEN 4020 packaged urethane foam system!

If you use truck-load or tanktruck amounts of semi-pre-polymer foam components, you can't get a lower material cost or a higher quality foam than that obtainable by the use of PLEOGEN 4052 polyether resin and the corresponding Mol-Rez semi-pre-polymer. At a cost comparable to a one-shot system, you can make, in an easily controlled reaction, a snow-white, non-friable, high-strength foam with excellent humid aging properties and unsurpassed resistance to shrinkage at sub-zero temperatures. **Write for bulletin M-31.**

MOL-REZ DIVISION
American Petrochemical Corporation
3134 California St. N. E.
Minneapolis 18, Minnesota, U. S. A.

THE PLASTISCOPE

Price turbulence in cellulose acetate

List prices in cellulose acetate have been fairly firm since 1958. The first break came when Celanese announced that prices would be raised beginning Nov. 3 to take effect with December shipments. The raise would put Group II, or translucent, materials at 52¢/lb., up 4¢ from the previous price, and Group III, opaque, materials at 46¢, a 6¢ increase. This is a rather daring move in an industry which has shown little growth in several years and needs a broadened market—but it emphasizes the squeeze between cost of production and selling price. At the time of going to press, other producers were noncommittal on whether or not they would go along with the price raise.

Polypropylene producers expand plants and formulations

Sales of polypropylene (PP) through July 1961 were reported by the Tariff Commission as a little over 33 million lb., but were expected to gather more momentum beginning in September and to reach a total of between 70 and 75 million lb. for the year. Of this total, approximately 12 million lb. is expected to be used for film. Bulk of the remainder of the poundage will probably be for molding and rope and other monofilaments.

Eastman has announced a 50% increase in capacity, which brings its total to 30 million pounds. Confidence in a growing market is given as the reason The plant uses a process invented in Eastman laboratories and the plant is laid out so that new units can be added without interference with present operations.

Enjay has signed an agreement to purchase the Extrudo Film Corp. for the equivalent of $3.50 for each of 500,000 Extrudo shares outstanding. Extrudo, one of the largest independent film producers, has plants in Pottsville, Pa., and Wentzville, Mo. It added PP film to its line some months ago. This acquisition follows Enjay's purchase with J. P. Stevens & Co. of the operating assets and facilities of the National Plastic Products Co., a long-time extruder of plastics monofilaments for textiles. Enjay has apparently subscribed to the philosophy of integration for PP and is developing its own customers with the usual explanation that this will help them to develop techniques to aid other customers and to be assured that it will have customers who can apply principles discovered in the Enjay laboratories.

The company has also announced a 4¢ reduction in the price of two PP grades designed for service at elevated temperatures for extended periods of time. They are now 42¢, the same as general-purpose PP. One is a molding grade designed for such things as automotive parts and the other an extrusion grade. Approval has also been received from the National Sanitation Foundation Testing Laboratory for five Escon grades so that they may be used for pipe, food service equipment, and other equipment which comes in contact with potable water.

More distribution hook-ups in PP

Allied Chemical's Plastics Div. has started marketing PP with a resin obtained from an unnamed present manufacturer. It will be called Plaskon PP. It has long been believed that Allied was preparing to enter the lists as a PP manufacturer; the company has even submitted samples to the trade. The custom of making arrangements to handle a current PP manufacturer's resin before one enters the business has now become regular procedure. The idea is to obtain marketing and de-

velopment experience before beginning production on a commercial scale. It's an interesting development in plastics marketing that is worth watching.

Union Carbide announced such an arrangement with Shell some time ago. Although Shell is not yet producing PP, Union Carbide is already offering PP for sale and immediate delivery. Furthermore, Carbide has now announced that it will produce cast and bi-oriented PP film under the aegis of the polymer products department of Union Carbide Development Co. at facilities that are located at Wayne, N. J.

Oriented PP film

Two companies announced improved bi-oriented PP film within the past month. Cryovac Div. of W. R. Grace is now marketing such a film that is suggested particularly for shrink wrap, although it is not limited to that field. Its largest use to date is reported to be for wrapping phonograph records. It is primarily a ½-mil film that will compete with thicker films in price, stiffness, and barrier properties. Price is listed at from 2¢ to 2.8¢/1000 sq. in., depending upon thickness. More details will be forthcoming in an article on PP film that is scheduled in next month's issue of this magazine.

Kordite has introduced Kordite 1000, a new oriented PP film that is an improvement over its previous oriented film. It is reported to offer moisture barrier properties twice that of conventional cellophane with a tensile strength equal to aluminum.

Polyethylene film for RR flat car loading

A new market of considerable volume potential for industrial polyethylene (PE) film can be seen in the announcement by Gering Plastics, Kenilworth, N. J., that it is supplying PE tarpaulins for covering products shipped on railroad flat cars. Idea is to permit use of flat cars for quick loading and unloading of items, such as lumber and gypsum board, which until now had to be shipped in standard box cars to protect them from the elements. (For details on the tarps and system, see p. 155 of this issue.)

Gering has also announced that it is now national sales agent for Cellulite expanded polystyrene, which is used in construction for perimeter, cavity-wall, and roof insulation, as backer board for aluminum siding and shingles, as insulation in refrigeration, in cushion packaging, and for various other uses. The product complements Gering's Ger-Pak PE film, used as a moisture barrier in construction, packaging, and agricultural applications. Cellulite is produced by The Gilman Bros. Co., Gilman, Conn.

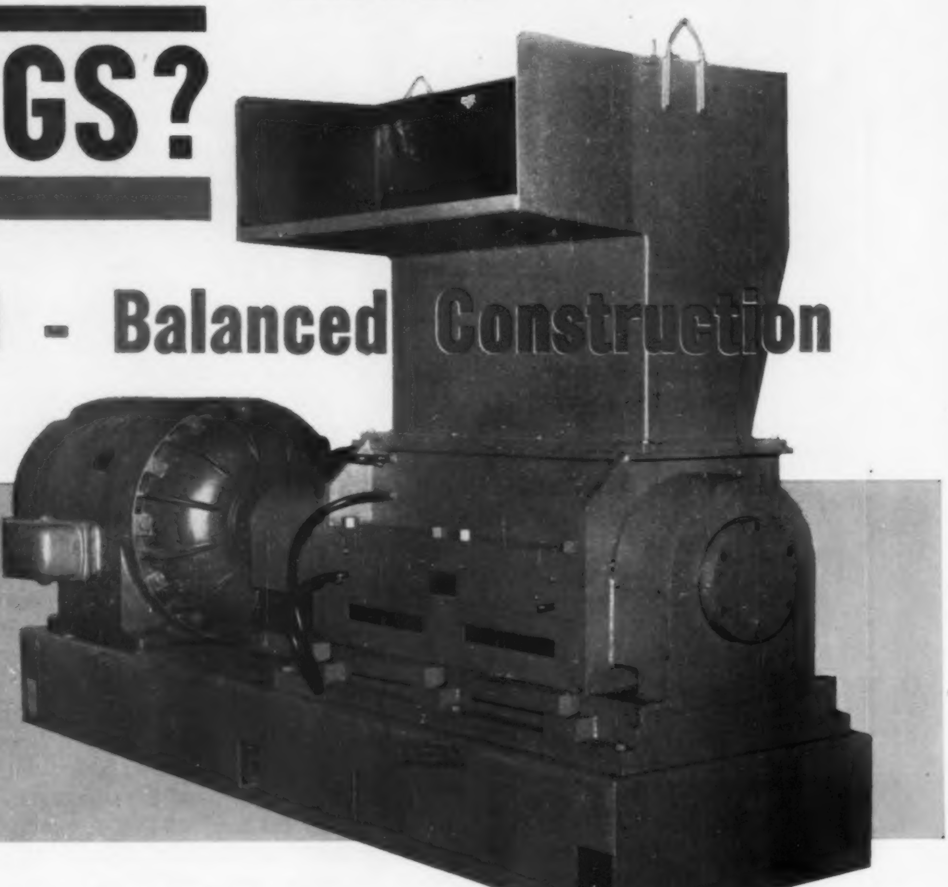
Erratum

The Metal Box Co. has vigorously protested a statement in this column two months ago that the company had been purchased by Shorko. The corrected statement should read that Metal Box has formed a joint company with Shorko to manufacture polypropylene film and film products mainly for distribution in the United Kingdom.

For additional and more detailed news see Section 2, starting on p. 228

BIG MAGIC IN HOGS?

NOW ALSTEELE has the new dimension for the BIG machine for BIG production in Hogs built with the usual Alsteele's "engineered to last".



Rugged - Balanced Construction

Alsteele's All Steel line of Hogs are the complete range of double extra heavy granulators for high production granulating of large plastic chunks or shapes.

A line of machines for granulating material which hitherto could not be granulated, <u>and</u> on a production basis.

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Manufacturers of the Largest and Most Complete Line of Granulators and Pelletizers

CUT YOUR LABOR COSTS
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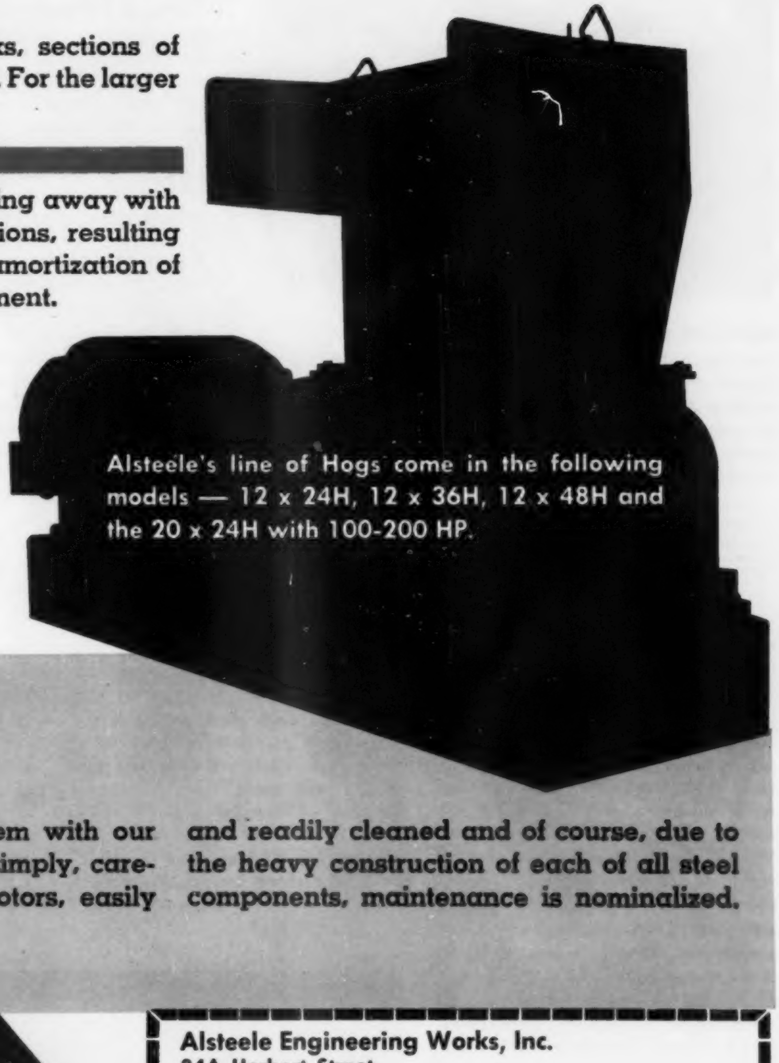
with Alsteele's extensive line of Hogs. For parts of high bulk, rather than length — the 20 x 24H — which reduces a full bale of GRS rubber in minutes.

The 12 x 24H for large chunks, sections of pipe, etc., hard or soft materials. For the larger parts the 12 x 36H.

This line of Hogs allows the doing away with of previous breakdown operations, resulting in many cases in remarkable amortization of the reasonable original investment.



Let Alsteele solve your problem with our NEW line of Hogs, designed simply, carefully balanced, heavy duty rotors, easily and readily cleaned and of course, due to the heavy construction of each of all steel components, maintenance is nominalized.

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Please forward me Alsteele's new complete brochure.

Send a representative to talk with me about Alsteele's new line of Hogs.

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NEW MACHINERY-EQUIPMENT

Specifications, claims made, and prices appearing in these pages are those of the manufacturers or sellers of the machinery and equipment described, or their agents.*

Injection molding gun

Not much larger than a soldering gun, the Model 81 Plastics Flogun is probably the smallest injection machine made to date. In operation, the gun is attached to the mold by means of a special clamp and a cylindrical rod of thermoplastic is loaded into the heating chamber. After sufficient time has elapsed to melt the plastic slug, a handle, similar to that on a caulking gun, is squeezed manually to force the molten material into the mold cavity. The shot capacity of the unit is 1.1 cu. in. and maximum mold cavity area is 7 sq. inches. Injection rate is variable up to 0.25 cu. in. per second. Heaters require 300 w. at 110 v. and temperature range is 100 to 600° F.; temperature is controlled to ±3° F. Injection pressure is variable between 1750 to 2250 p.s.i.; unit is 14¾ in. long and weighs 3¼ pounds. Gun is recommended for short run production of small parts, and for the injection of molten thermoplastic into cable splices and potting applications. A line of auxiliary equipment, including special mold clamps and gun holders along with other accessories is also available. *Northwest Industries Ltd., Edmonton, Alberta, Canada.*

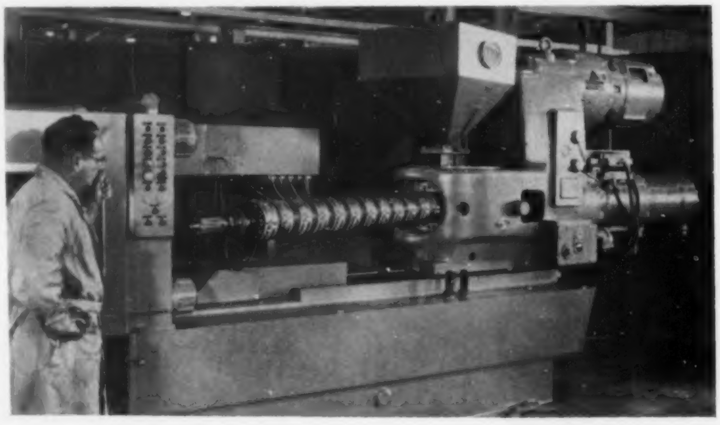
* Prices are deemed to be F.O.B. sellers' plants (unless otherwise stated), are for "standard" models, and are subject to change without notice. The publishers and editors of **Modern Plastics** do not warrant and do not assume any responsibility whatsoever for the correctness of the same or otherwise

Foam press

The C-Z expandable polystyrene foam molding press has been designed for completely automated operation. Dry cycle rate is 17 sec. per cycle using a 47-in. stroke. Clamp pressure is adjustable up to 50 tons. Mold closing action is horizontal, using molds with vertical parting lines. Molds are mounted on adjustable horizontal matrix bars; a new locking device, a bevelled slot, plus adjustable locking blocks, are used to fasten the mold. Working mold area is 36 by 48 in. wide. The press will produce parts up to 12 in. deep using box type molds, and up to 20-in. or more using flange-mounted, contoured steam-chamber molds. Most small molds can be mounted and dismounted in less than 15 minutes. Press provides for "cracking" molds with

Injection machines in range of injection and clamping combinations

This line of Natco Screw-Ram injection machines is available in several combinations of injection and clamping units. Screw-ram units are being built with 2¾-, 3½-, and 4¾-in. screw diameters. Injection capacities are 35, 60, and 140 oz., respectively. Straight line hydraulic mold clamping units are furnished in 325-, 425-, 650-, 850-, and 1200-ton sizes. Platen sizes are 33, 38, 48, 55, and 65 in. square, respectively. Using multiple speed transmissions and change gears, each injection unit is capable of 12 screw speeds. The 2¾-in. screw model uses a 3-speed transmission and 4 sets of gears to produce speeds between 15 and 120 r.p.m. The larger sizes use 4-speed transmissions, and 3 sets of change gears provide screw speeds of 15 to 117 r.p.m. and 8 to 80 r.p.m. for the 3½- and 4¾-in. screws, respectively. Oversize screw motors, 30, 60 and 100 hp. for the progression of sizes, allow the proper selection of hp.-torque combinations to suit a wide variety of materials. Three types of screws are available: general purpose, a nylon screw, and one for rigid polyvinyl chloride. Only one screw and one set of change gears are supplied with each machine; additional screws and gear sets are optional at extra cost. Each screw is equipped with a ring check valve to prevent backflow of material on the injection stroke. The screw rotates only when plasticating; a single shot is plasticated, the screw stops, and injection follows. For easy removal of the screw, the barrel of the machine may be swung away from the mold platen on a pivot, so that the screw may be pulled clear of the machine. Screw drives for this line of machines are electro-mechanical with separate motors for the drive and hydraulic systems. *National Automatic Tool Co. Inc., Plastics Machinery Div., Richmond, Ind.*



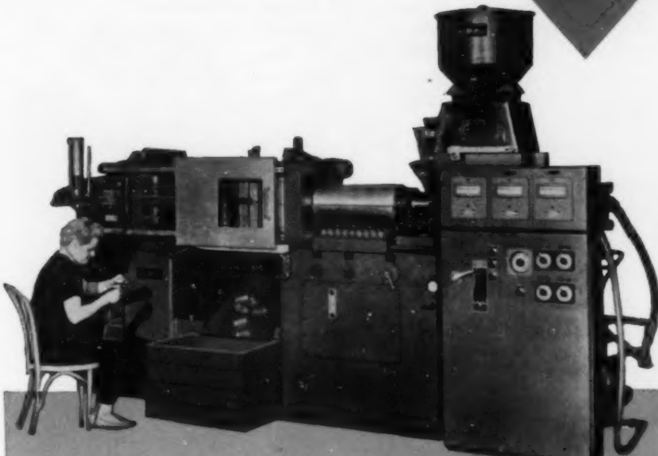
"COMPLETE AUTOMATION"

Prominent toy manufacturer operates their fully automatic Van Dorn 3 oz. presses 24 hours per day, 6 days per week. They also report their Van Dorn presses substantially reduce cycle time, are economical, versatile, and require minimum maintenance.

Model H-300

GAIN 3 WAYS

with VAN DORN Presses



Model H-400

Model H-260

"PACKAGE SERVICE"

The user of this Van Dorn 4-6 oz. press had a well conceived idea for a plastic part, but no molding experience. So they had Van Dorn engineers help them procure a well designed mold from a competent moldmaker; then checked the operation of the finished mold on a Van Dorn factory demonstration unit. This free Van Dorn "Package Service" insures satisfaction, helps produce profits.

"25% LESS CYCLE TIME"

This is the report of a progressive custom molder about his Van Dorn 2½ oz. presses. He also says that they "give fast set-ups, and less waste in purging from one material to another. Van Dorns are extremely fast, versatile and economical."

Write for Illustrated Specification Bulletins on these Van Dorn Plastic Presses.

Van Dorn

THE VAN DORN IRON WORKS CO. • 2685 EAST 79TH STREET • CLEVELAND 4, OHIO

Sales and Service Nationwide In Canada: B. J. Danser & Assoc., Ltd., Toronto, Ontario

a gap between 5 and 250 mils; a safety stop prevents crushing the mold. Press is completely instrumented to allow maximum flexibility in the choice of cycle sequences and modes of mold operation. Mold filling equipment is supplied with the unit. Unit requires steam (40 hp.) at 125 p.s.i./min.), air (100 p.s.i./min.; 20 hp. compressor with after cooler), vacuum (25 in. of mercury 30 cu. ft./min. wet-type pump), water (50 to 60° F., 60 to 70 p.s.i. at machine), and electricity (3-phase, 220 v., 50-amp. supply.) Timers control preheat, weld, clamp, dwell, and cooling portions of cycle individually. A conveyor is supplied to remove parts from the press. Molds for the press are also available. *Champlain-Zapata Plastics Machinery Inc., P. O. Box 883, Kulick Rd., Caldwell, N. J.*

Portable infra-red heating panels

These electric infra-red portable heating panels may be formed into ovens for curing and heating in plastics processing operations. The panels are offered in a variety of widths and heights, and consist of hinged horizontal sections which may be formed into quarter-round sections to make "ovens," when using two panels face-to-face. Four different reflector wattages from 125 to 500 w., using either Chromalox Metarays or G-30 glass lamps, are available. The heat sources have 12-in.-square anodized aluminum reflectors for uniform radiation at distances over 10 inches. Reflectors are mounted in die formed press steel banks of 4-, 6-, and 8-ft. widths. A 20-ft. supply cord and cap is furnished for connection to a 240-v., 3-phase power supply. *Radcor Inc., a subs. of Edwin L. Wiegand Co., Bradner, Ohio.*

Kettle for mandrel salts

The Trent KA kettles were specifically designed for the melting of Paraplast, a material used for casting filament winding mandrels, and similar hot-melt, water-soluble materials. The cast mandrels are used for producing fibrous glass-reinforced plastics parts of complex shape where the mandrel must be capable of being dissolved. The cylindrical kettle is jacketed on both sides and bottom for uniform heating. Adjustable controls hold the melt to within ±0.5° F. of any temperature up to 550° F. An agitator is furnished for either motorized or manual operation. An electrically heated quick-acting lever valve with automatic control keeps salts hot until the actual pour. Kettles are available in capacities from 90 to 5800 lb. of melt. *Trent Inc., 211 Leverington Ave., Philadelphia 27, Pa.*

Foaming machine

For rigid urethane foam formulations, Viking Mark III-A and IV-A foaming machines have exclusive annular pumps which allow the units to be calibrated to NAFIL formulations. The user simply dials lb./min. flow rates without the need for weighing components or metering checks. The unit is used with a Viking Mark-V spray or pour head, which is self cleaning and stays clean during intermittent or continuous use; it has a dwell time up to 4 hr. between shots. Elimination of solvent flush improves safety and contamination of foam problems. A simple lever changes from spray to pour operations. The unit can be equipped with a revolution counter or automatic reset cycle timer to eliminate over or underfills. *Chase Chemical Corp., 3527 Smallman St., Pittsburgh 1, Pa.*

Thermoplastic sheet bender

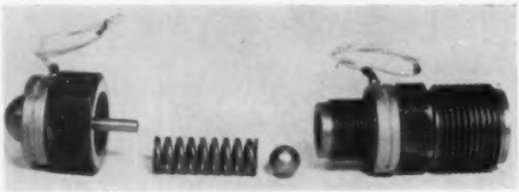
The Kamweld heating unit is designed for uniform and accurate heating of thermoplastic sheets to make single and double bends. It consists of two rectangular aluminum heating bars: a top and bottom section. The bars are electrically heated and each bar has four heating faces—⅜-, ½-, ¾-, and 1-in. wide—to handle sheets from 1/16- to ¾-in. thick. Each bar has two insulated handles, 10 ft. of electrical cord, and a plug. Two support angles and a marking crayon are supplied with each pair. Models are available for 36- and 54-in.-wide sheets. *Kamweld Products Co., 932R Washington St., Norwood, Mass.*

Web tension controller

Called the Auto-Tensioneer, this electro-mechanical device is designed to maintain constant pre-set tensions in moving webs of plastic sheet and film in process. It can be installed at any location in the line. Either a "live" or "dead" sensing roll may be used. Web tension, as measured by the sensing roll, is relayed through a pair of load cells to automatic controls. These, in turn, operate a servo-valve, which adjusts the air-operated brake pressure up or down to give the web tension desired. An indicator shows the tension at all times. A torque motor is used to power the servo-valve. *John Dusenbery Co. Inc., 395 Allwood Road, Clifton, N. J.*

Injection nozzle

This positive shut-off injection machine nozzle has a ball-type action and stop to support the spring and limit ball travel. The removable nozzle tip has the spring support stud cross-drilled to allow passage of the plastic through it into the mold. The nozzle is recommended for nylon



and other low-viscosity melts. The nozzles may be adapted for use in most injection machines. Stock Model 3 (½-in. radius) or Model 4 (¾-in. radius) are 5 in. long, have a 1¾-in.-diam. screw with a No. 8 thread on it, and two 1½-in.-diam. by ½-in.-wide heater bands. Nozzles are priced at $175.50. Both available for either 110- or 220-v. service. *Injection Molders Supply Co. Inc., 17601 S. Miles Rd., Cleveland 28, Ohio.*

Blow molder

The T.I.P.C. blow-molding machine is a two-mold station machine designed for use with a 1.5- to 1.7-in. extruder having an L/D ratio of 20:1 and screw speeds variable

between 36 and 90 r.p.m. Mold clamping force is 3 tons on a maximum clamp cycle of 20 cycles per minute. In operation, the extruder runs continuously, its output (up to 33 lb./hr.) being diverted alternately between blowing stations. Typical production claimed for the machine is 120 liter or quart bottles per hour. Maximum size of bottles moldable is 5.9 in. in diameter by 11.8 in. long. Manufactured by Thermo-Plastics Industrial Co. Ltd., Tokyo, Japan and sold by Nichimen Co. Ltd. also of Tokyo. *U. S. Agent: Nichimen Co. Inc., 6 N. Michigan Ave., Chicago 2, Ill.*

Vacuum mixers

These machines have been designed for intensive kneading and mixing of the heaviest types of plastic masses and compounds, under vacuum if desired. The double-arm kneaders have vacuum-tight covers, built-in hydraulic trough tilting device, and 1:1 ratio of hp. to capacity in gallons. Heavy-cast steel mixing arms are uniformly driven on both ends for even load distribution and operate in self-aligning roller bearings. These mixers and kneaders are offered in sizes between 1 pt. and 150 gal. working capacities. *Charles Ross & Son Co., 148-156 Classon Ave., Brooklyn 5, N. Y.*

Constant tension unit

Suitable for use in plastic film processing operations, the Stanford Model 900 pneumatic constant tension unit operates on air supplied to two connected air diaphragm cylinders mounted on the unit frame. These are linked to the dancer or sensing roll. The air cylinder pressure sets the tension in the roll, and the air pressure is regulated by the operator. At the end of the sensing-roll pivot shaft is a cam, which actuates a regulator supplying air to a brake. As the tension sensing roll moves up or down, there is either more or less braking, which serves to automatically regulate the web tension. *Stanford Engineering Co., Box 369, Salem, Ill.*

Hot knife

For sealing and cutting operations, these low-voltage hot knives may be used for trimming gates, sprues, and runners; cutting sheet; or as a smoothing spatula in welding operations. For unusual applications, the knife blade may be bent to suit the need. The knife blade is made of nickel-chromium and is 4 in. long, 1 in. wide and 1/16 in. thick, mounted in a wood handle. Standard blade temperature is 950° F.; operating temperature may be increased by modifying the blade to offer more resistance. Unit is equipped with low-voltage power supply and 12 ft. of connecting cable. *Sta-Warm Electric Co., a subs. of Wakefield Corp., Ravenna, Ohio.*

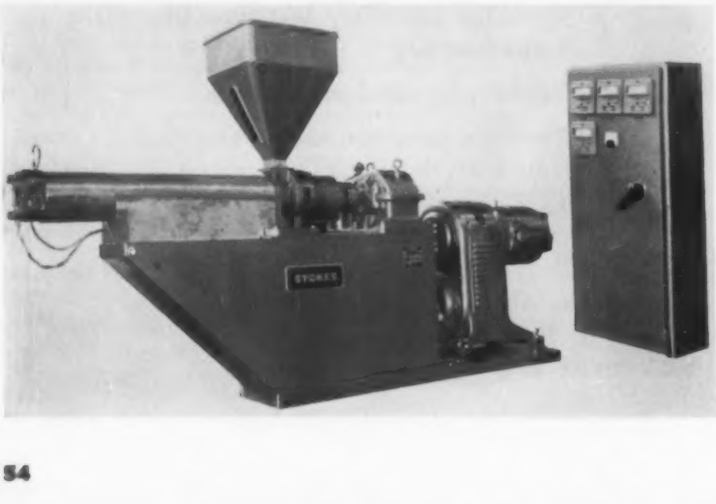
Automatic wipe in machine

Designed for the automatic finishing of plastic parts, such as dials and emblems, wherein first or second surface depressions are to be filled, then wiped and polished, this machine has a rotary table with eight spindles which spin in five stations and can be loaded or unloaded in three stations. The table can be equipped for any combination of five interchangeable accessory heads including fill, smear wipe, full wipe, light buff, and painting heads. In operation, the spinning part proceeds from the fill progressively through to polishing, where it is finished. Wiping materials or cloths are usually in roll form; the wiping cloth is advanced after each operation so clean cloth is used for the next part cleaning. *Conforming Matrix Corp., 787 New York Ave., Toledo 11, Ohio.*

Compression molding system

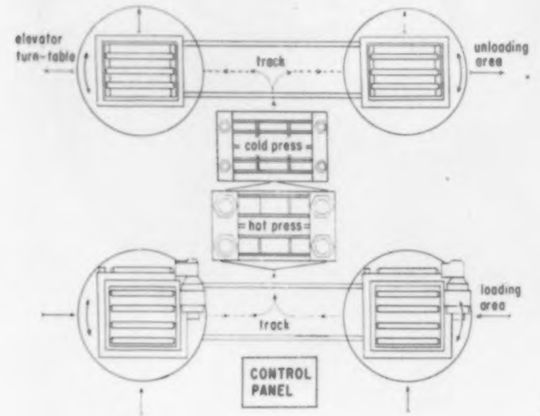
This system has been designed for the compression molding of laminates and other plastic materials which require successive hot and cold pressing operations. First part of the system consists of two multiple-platen loading racks which, after manual loading, alternately and automatically feed a hot multiple-platen molding press. The loading racks are on turntables so that they may be loaded with mold assemblies arriving on conveyors from either of two

Single-screw extruders available in two sizes



For film-extrusion and blow-molding applications, these Stokes 2½- and 3½-in.-diameter single-screw extruders are available with 20:1 L/D ratios. The 2½-in. size is designated Model 850; the 3½-in. size, Model 851. Both of these models have integrally cast Xaloy barrel liners as well as four-zone temperature control. Feed sections are water-cooled and have an extra large feed throat. Large hoppers with sight-glass and shut-off gate are standard equipment. Radial and thrust bearings are oversized. Controls for these single-screw extruders are housed in a separate cabinet. *F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa.*

directions at right angles to each other. The loading racks are mounted on tracks on which they are automatically moved and indexed in front of the press for transfer of the work to the molding press. After indexing, the mold assemblies are automatically pushed into matching multiple-platen openings in the hot molding press. As the mold assemblies move into the hot press, they push the previous load of molds from the hot press into the matching cold press in tandem with the hot press. Both presses then close on the work for the molding and cooling cycles,



respectively. After cooling, the work from the cold press is ejected by the next batch of moldings from the hot press into either of two automatic unloading stations, which are similar to the loading stations. After the loading station picks up the work from the cold press, it moves to either of two unloading stations and is manually unloaded. Like the loading stations, the unload stations are on turntables to allow the work to be taken away in either of two directions at right angles to each other. Each press and loading rack will take five or more units to work up to 24 in. square. Present unit has a hot press with a clamp capacity of 450 tons, and a cold clamp capacity of 100 tons; any combination of clamps ranging from 100 to 10,000 tons can be supplied. Unit requires a crew of five; one man to operate automatic control console, two men to load, and two men to handle the unloading. *Birdsboro Corp., Birdsboro, Pa.*

Temperature controller

Designed for injection molding, blow molding, extruders, and heat-sealing machines, this temperature controller incorporates a safety feature which prevents starting the machine before the plastic is up to the required temperature, thus avoiding damage to the machine. Also, the controller will shut the machine down if the heater elements fail and the plastic cools. The controller is of the proportioning type. *Alnor Instrument Co., 420 N. LaSalle St., Chicago 10, Ill.*

Foam press

The J. C. Model 2236 H expandable polystyrene foam molding press is said to have molded over 800 sq. in. of area using a foam with a 2¾ lb./cu. ft. density. Vertical spacing between tie bars is 22 in.; horizontal spacing is 36 in., which permits the use of molds 21 by 40 in. or 34 by 38 in. with normal overhang. Minimum and maximum daylight are 20 and 44 in., respectively, with the standard 24-in. clamp stroke. Clamp force is about 20 tons. Services required by the press are an hydraulic system, water supply, compressed air, and steam for heating. Press is supplied with controls, and hydraulic system according to customer's requirements at extra cost. Standard press alone with one timer is priced at $5700. *J. C. Mfg. Co., 2933 W. Fullerton Ave., Chicago 47, Ill.*

Compression press

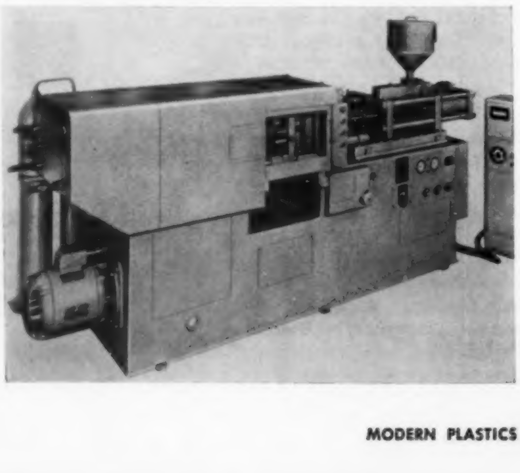
Pasadena Hydraulics has expanded its line of compression presses to include models ranging from 150 to 1000 tons in clamp force. All are equipped to provide flexibility, including adjustable clamp force, sequential cycling, preselected holding time, and adjustable clamp speed. Typical is a 600-ton model which has a 60-in. stroke, 72 in. of daylight, and 60-in.-square platens. Platen temperatures are individually controlled and platens may be heated by steam or electricity. Press requires 7-ft.-square area, and control console is mounted on either side of the machine at the customer's option. *Pasadena Hydraulics Inc., 1433 Lidcombe, El Monte, Calif.*

Trimming press

Suitable for use in the trimming of large plastic parts, this 4-bar trimming press is equipped with an adjustable deceleration valve, and is capable of exerting 100 tons of force on the trim stroke. Press has a fast approach velocity of 900 in./min. and a return speed of 875 in./min.; a slow speed of 59 in./min. is used for actual trim cut. Die area is 36 by 72 in. on a 52- by 88-in. supporting base platen. Unit has safety stops on the tie bars and a stroke of 30 inches. *B & T Machinery Co., a div. of Greenlee Bros. & Co., Holland, Mich.*

Injection machine

This Bipel injection machine has a novel heating cylinder design in that the nozzle is mounted eccentric to the axis of the cylinder. This allows the insertion of cartridge heaters into the spreader. With the external cylinder heaters' consumption rated at 5.7 kw. and the spreader heaters rated at 1.5 kw., this unit has a rated plasticating capacity of 60 lb./hr. and will deliver 4 oz. (polystyrene) on a single stroke; 6 oz. with double stroke. Clamping force is 120 tons and the overall dry cycle time is 3.5 seconds. Maximum rated projected area is 60 sq. in.; molds up to 9 in. thick can be used, provided they fit between the tie bars which are 14¼ in. apart. Maximum in-



NEW MACHINERY-EQUIPMENT

Specifications and claims are those of the manufacturers and/or their agents.

jection pressure is 19,000 p.s.i. Clamp mechanism is straight hydraulic; no toggles. *B. I. P. Engineering Ltd., Sutton Coldfield, Eng. U. S. Agent: Ralph B. Symons Assocs. Inc., 3571 Main Rd., Tiverton, R. I.*

Hopper loader

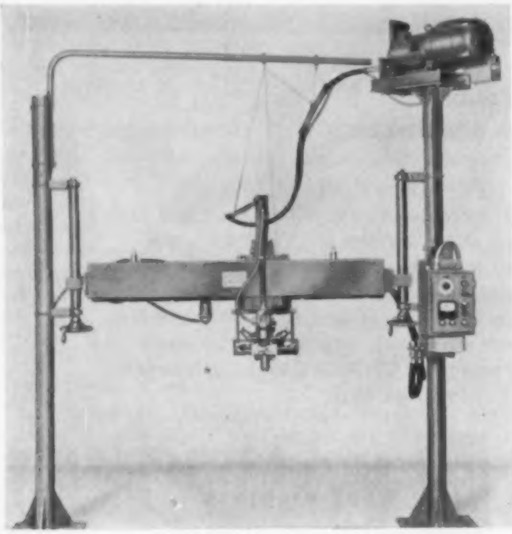
The B & J Transfermatic is a venturi-type pneumatic conveyor for transferring powders and granular plastics from bins or drums to the hoppers of plastic processing machinery. Depending on the compressed air pressure used to power the unit, it will transfer materials at rates ranging from 75 to 800 lb. per hour. The unit comes complete with pressure gage, pressure regulator, and air filter. It is designed for operation with 150-p.s.i. plant air supplies; optimum transfer rates are obtained at pressure settings under 30 p.s.i. *Ball & Jewell Inc., 22 Franklin St., Brooklyn 22, N. Y.*

Injection press

Extensive design changes have been incorporated in the new Van Dorn Model H-260A 2-oz., twin tie-bar injection press. Unit is now equipped with plug-in cycle flex timers and relays for easy maintenance. A separate control cabinet houses machine controls for operator convenience and elimination of vibration in the control system. A step-down transformer provides 110 v. for control circuits, relays, contactor, and solenoid coils so that only a single connection to a 220-v. supply is required. Heating cylinder design has been improved and electrical wiring simplified to provide easier maintenance. *Van Dorn Iron Works Co., 2685 E. 79th St., Cleveland 4, Ohio.*

Urethane foam traverse mechanism

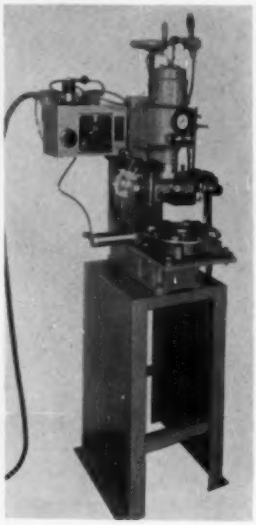
This equipment is primarily designed for the uniform deposition of polyurethane foaming compounds on moving belts for the production of foam slab stock. In operation, the unit is designed to move a urethane foam mixing head back and forth over a preselected length of stroke at a preselected speed, and with a given rate of foam velocity from the mixing head, thereby controlling the amount of foam made per unit length of the foaming belt or conveyor. The traverse drive is air driven and requires air at 90 p.s.i., 0.9 hp., at a rate of 40 cu. ft./min. free air. Models commonly used have strokes adjustable from 12 to 48 in.; greater strokes are available. Commonly used models have traverse speeds adjustable from 1 to 4 ft. per second. Complete systems will be engineered to suit customers' requirements. *The Martin Sweets Co. Inc., 3131 W. Market St., Louisville 12, Ky.*



Twin-screw extruder

Thought to be among the largest twin-screw extruders in the world, the Mapré E2-60-160 double-screw extruder has a screw with a diameter of 6.3 in., and is expected to find its major use as a pipe and compounding production unit. Typical output rates for tubing and profiles range up to 650 lb./hr.; output rates for pellet production range up to 1500 lb./hr. depending on material. The machine uses a novel combination of steep-angle helical spur gears and specially designed multi-thrust bearings in its thrust bearing system. A special hydraulic control unit provides stepless variation of screw speeds from 0 to 33 r.p.m. Total heater capacity in three bands of eight and one of 4 kw. is a total of 28 kw. The unit is supplied with a 50-hp. motor. Machine can be equipped with an optional feed hopper capable of feeding various materials including pastes. *Mapré S. A. Diekirch, Luxembourg.*

Air-operated hot stamping machine



Called the EA-12, this air-operated hot-stamping machine has a 6-in.-square stamping area and a 5000-lb. cylinder. A similar model, EA-10 has a 4- by 6-in. stamping area and a 2000-lb. force cylinder. Both models may be specially equipped, depending on the item to be stamped, with rotary turntable, flatbed, slide table or completely automatic feeding. This may be done using standard or specially modified models. Marking is done using brass or steel, dies or type, using appropriate foils. *Apex Machine Co., 14-13 118th St., College Point, N. Y.*

Plastic pipe cutter

An easily inserted cutting wheel, specially designed for cutting plastic pipe, is now available for use in the Rigid No. 205 Tubing Cutter. Recommeded for either thin- or heavy-wall rigid pipe, the cutter has a capacity to cut up to 2 in. Schedule 120 plastic pipe (¼ in. wall thickness). Use of the tool eliminates internal and external burrs because of its design; burrs interfere with proper joining of pipe in fittings. In addition, the cut is absolutely perpendicular as contrasted to saw cuts, which also contributes to sound pipe joints. *The Ridge Tool Co., Elyria, Ohio.*

Web tension meter

In plastic web handling processes, the Saxl Web Tension Meter No. 86-1-4 may be used for spot checks of the tension in moving webs. Two dual-range models are available; one for measurements of tensions from 0 to 200 and 0 to 1000 g., the second for values from 0 to 400 and 0 to 2000 grams. Exclusive features include **(To page 167)**

WORLD-WIDE PLASTICS DIGEST*

Abstracts from the world's literature relative to plastics. For complete articles, send requests direct to publishers. List of addresses is at end of this section.

Materials

Olefin-substituted silicas as active fillers of polymers. I. E. Neimark, A. A. Chuiko, and I. B. Sliniakova. Vysokomolekuliarnye Soedineniia *3*, 711-15 (May 1961). Incorporation of highly disperse unsaturated olefin-substituted silica in methyl methacrylate during polymerization yields polymers with modified properties.

Physical and mechanical properties of polypropylene fractions. J. van Schooten, H. van Hoorn, and J. Boerma. Polymer *2*, 161-84 (June 1961). A large-scale fractionation of polypropylene according to molecular weight and crystallinity was made. Evaluation of the fractions and of mixtures thereof showed that yield stress, dynamic modulus, drop in dynamic modulus at the transition point, mechanical damping, and hardness depend only on the degree of crystallinity, whereas impact strength and elongation at break also depend on molecular weight and molecular weight distribution. A high impact strength requires a high molecular weight and a narrow molecular weight distribution. A correlation was found between tensile impact strength and loss factor at the glassy transition point. The morphological structure of the various fractions is described.

Polyamide-hardened epoxy resins in building. H. Niemann. Kunststoffe *51*, 400-03 (July 1961). A new, mortar-like building material based on 10 to 15% polyamide-hardened epoxy resin and 85 to 90% quartz sand is described. This resin hardens at room temperature in 24 hr., is non-toxic, has high mechanical strength, good chemical resistance, and exhibits excellent adhesion to a variety of different materials.

Synthesis and properties of some polyaminoquinones. V. P. Parini, Z. S. Kazakova, M. N. Okorokova, and A. A. Berlin. Vysokomolekuliarnye Soedineniia *3*, 402-07 (Mar. 1961). The properties of several polyaminoquinones are reported. Some are nonfusible and give electron resonance signals. The aromatic polymers are thermostable. Some of them are also electroconductive.

Molding and fabricating

Effects of recent fundamental investigations on extruder design. G. P. M. Schenkel. Int. Plastics Eng. *1*, 315-23 (July 1961). Recent work in the extrusion field, both theoretical and practical, shows how advanced technological understanding reflects in the design, construction, and operation of extrusion equipment. The energy balance in the extruder, the working area in the output/pressure diagram, and pressure build-up in the feed section are considered.

Applications

Polymer-coated polyethylene. O. J. Sweeting and J. J. Levitsky. Modern Packaging *34*, 128-30, 184 (Mar. 1961). The properties of a new polyethylene film, coated on both sides with a polymer, are described. This new material shows exceptionally low gas permeability and good resistance to grease and odor permeability compared to conventional polyethylene, while retaining the best properties as a packaging material.

Properties

Strength of joints in reinforced polyester. J. Leeuwerik, G. J. Spies, and H. A. Bak. Plastics *26*, 141-3 (Mar. 1961). The strength of various bonded joints in polyester laminates was investigated. In general, the scarf joint is stronger than the lap joint. Details of preparation of the polyester laminates and of test specimens, using two types of epoxy adhesives, are described. Tests were conducted on polyester-polyester and polyester-duraluminum specimens.

Melting temperatures and rates of crystallization of polymethylene sulfide and polymethylene oxide polymers. J. Lal and G. S. Trick. J. Polymer Sci. *50*, 13-19 (Mar. 1961). Polymethylene sulfide and polymethylene oxide polymers were synthesized to study the influence of sulfur and oxygen atoms on melting temperature and rate of crystallization. Substituting oxygen for sulfur lowers the melting temperature but does not change the rate of crystallization.

Electrical properties of polymeric power-cable dielectrics. N. Parkman. Plastics Inst. Trans. *29*, 73-78 (June 1961). The breakdown of rubbers and plastics used as electrical insulating materials and related electrical phenomena are described. Impregnated paper, polyethylene terephthalate, polystyrene, polycarbonate, natural rubber, butyl rubber, silicone rubber, polyvinyl chloride, and polyethylene are considered.

Combined time-temperature data for electrical/electronic laminates. Electro-Technology *68*, 116-17 (July 1961). The flexural and electric strengths of selected plastics laminates after exposure to temperature of 130, 220, and 260° C. for times from 3 min. to 100 hr. are given.

Behavior of bacteria mixtures towards polyethylene of different molecular weight. Lü Jen-hao and A. Schwartz. Kunststoffe *51*, 317-19 (June 1961). The results of investigations made on the relation between molecular weight and the susceptibility of polyethylene towards potential bacterial attack are reported in detail.

Testing

Long-term burst testing for plastics pipe. D. A. Gill. Brit. Plastics *34*, 126-30 (Mar. 1961). The essential requirements for conducting long-term burst tests on plastics pipe are described. The methods by which use life of pipe are predicted from test data are given. The equipment used for testing both small- and large-diameter polyethylene and polyvinyl chloride tubing is illustrated and described in detail.

A new stress-flex tester. A. C. Horst and R. E. Martin. Modern Packaging *34*, 123-6, 170, 173, 175 (Mar. 1961). A test method was devised to allow laboratory prediction of the durability of plastics for packaging. The mechanical action of the test equipment simulates physical stresses that can lead to package failure by inducing both pull and flex. Good correlations are obtained with the use of actual packages.

Publishers' addresses

British Plastics: Iliffe & Sons Ltd., Dorset House, Stamford St., London SE1, England.

Electro-Technology: C-M Technical Publications Corp., 205 E. 42nd St., New York 17, N. Y.

International Plastics Engineering: Iliffe Industrial Publications Ltd., Dorset House, Stamford St., London AE1, England.

Journal of Polymer Science: Interscience Publishers Inc., 250 Fifth Ave., New York 1, N. Y.

Kunststoffe: Karl Hanser Verlag, Leonard-Eck-Str. 7, Munich 27, Germany.

Modern Packaging: Modern Packaging Corp., 770 Lexington Ave., New York 21, N. Y.

Plastics: Temple Press Ltd., Bowling Greene Lane, London E1, England.

Plastics Institute Transactions & Journal: The Plastics Institute, 6 Mandeville Pl., London W1, England.

Polymer: Butterworths Scientific Publications, 4 and 5 Bell Yard, London WC2, England.

Vysokomolekuliarnye Soedineniia: Academy of Science of U.S.S.R., Moscow, Russia.—**End**

*Reg. U.S. Pat. Off.

Typical casting made with ordinary low-viscosity epoxy containing volatile diluents that foam out at room temperature under vacuum.

This coil was impregnated with RCI EPOTUF 37-129 under a full vacuum of 29.5 inches of mercury. Note absence of bubbles, smoothness of surface.

U.S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

U. S. Pats., July 11, 1961

Epoxy resins. D. Porret, W. Fisch, and O. Ernst (to Ciba). 2,992,193.

Polyamide resins. H. H. Young and S. B. Luce (to Swift). 2,992,195.

Polyepoxide composition. C. S. Ilardo, C. T. Bean, and P. Robitschek (to Hooker). 2,992,196.

Vinyl resins. M. A. Coler, J. A. Cutler, and A. S. Louis. 2,992,199.

Polyethylene-polysiloxane compositions. H. F. Gober Jr. (to Eastman Kodak). 2,992,201.

Impact-resistant acrylics. T. F. Protzman (to Rohm & Haas). 2,992,203.

Polyethylene composition. M. H. Broyles and R. E. Gibson (to Eastman). 2,992,205.

Aldehyde-pentaerythritol resins. H. R. Guest, B. W. Kiff, and C. B. Halstead (to Union Carbide). 2,992,207.

Polynuclear aromatic-formaldehyde resin. I. W. Mills and P. B. Murray (to Sun). 2,992,208.

Polyacrylonitrile. M. Q. Webb and W. K. Wilkinson (to Du Pont). 2,992,209.

Tetrafluorobutadiene copolymers. E. S. Lo and G. H. Crawford (to 3M). 2,992,211.

Polypropylene. E. H. DeButts (to Hercules). 2,992,212.

Cellulose esters. J. W. Mench, B. Fulkerson, and U. K. Schutt (to Eastman). 2,992,214.

U. S. Pats., July 18, 1961

Chloromethylstyrene-polyvinyl aromatic copolymers. E. L. McMaster (to Dow). 2,992,544.

Perfluoroalkanoyl esters of cellulose. R. J. Berni and T. F. Fagley (to U. S.). 2,992,881.

Polylactam rocket propellant. R. M. Hedrick and E. H. Mottus (to Monsanto). 2,992,908.

Rocket fuel. E. Whitworth (to Imperial Chemical). 2,992,911.

Destaticized articles. M. A. Coler. 2,993,022

Polyoxymethylene compositions. R. G. Alsup and P. E. Lindvig (to Du Pont). 2,993,025.

Epoxy composition. W. C. Duckworth and J. E. Singley (to Tennessee). 2,993,026.

Polymerizing vinylene carbonate. G. E. Ham and M. Zief (to J. T. Baker). 2,993,030.

Carbamate polymers. W. W. Bakke, W. E. Walles, and W. F. Tousignant (to Dow). 2,993,031.

Detergent copolymers. F. A. Stuart, W. T. Stewart, and W. Lowe (to California Research). 2,993,032.

Methacrylate copolymers. J. L. O'Brien (to Rohm and Haas). 2,993,033.

Vinyl chloride - vinyl epoxystearate copolymers. D. Swern (to U. S.). 2,993,034.

U. S. Pats., July 25, 1961

Cellular structures. P. Hoppe and H. W. Paffrath (to Bayer & Mobay). 2,993,233.

Antistatic record disks. Y. Miura and S. Hayashi (to Tokyo Shibura Electric.) 2,993,234.

Photopolymerization. H. E. Crawford (to Du Pont). 2,993,789.

Triazinyl ester and amide polymers. G. F. D'Alelio (to Dal Mon Research). 2,993,877.

Methacrolein polymerization. B. M. Marks (to Du Pont). 2,993,878.

Maleic anhydride-modified petroleum resin. C. L. Aldridge and A. B. Small (to Esso). 2,993,880.

Polymeric carbinoxysilanes. D. R. Huster (to 3M). 2,993,925.

U. S. Pats., Aug. 1, 1961

Plastic sidewalk. J. F. Shumaker. 2,994,254.

Cyanoethylated cellulose sheets. J. E. Jayne (to Kimberly-Clark). 2,994,634.

Polymerizing 3,3-bis(chloromethyl)oxetane. E. K. Klug (to Hercules). 2,994,668.

Ion-exchange. H. Hader (to Wolfen). 2,994,669.

Styrene-glycidyl acrylate foam. G. F. D'Alelio (to Koppers). 2,994,670.

Epoxy ether resin. N. J. Capron and B. E. Lederman (to Pennsalt). 2,994,673.

Polyamines. R. N. Haward and T. H. Boultbee (to Shell). 2,994,675.

Acrylonitrile interpolymer. J. Kucsan and B. B. Kine (to Rohm & Haas). 2,994,676.

Condensation polymers containing nitrogen. R. G. Parrish (to Du Pont). 2,994,678.

Graft copolymers. H. G. Hammon, R. A. Clark, and J. W. Uttley Jr. (to Shell). 2,994,680-1-2.

Graft copolymers. W. C. Calvert (to Borg-Warner). 2,994,683.

Epoxy compositions. J. Delmonte and W. J. Dewar (to Furane Plastics). 2,994,685.

Trifluoromethylsaliginen. M. Hauptschein (to Pennsalt). 2,994,686.

Sulfochlorinated hydrocarbon polymers. K. F. King (to Du Pont). 2,994,688.

Petroleum resins. F. W. Banes, S. B. Mirviss, and J. F. Nelson (to Esso). 2,994,689.

U. S. Pats., Aug. 8, 1961

Plastic pipe. K. A. Schafer and H. D. Boggs (to H. D. Boggs). 2,994,919.

Shoe with molded sole. J. Pafera (to Bata Shoe). 2,994,920.

Cellulose ether film. (D. T. Milne). 2,994,924.

Floor tile. M. S. Scholamiero (to Patent and Licensing). 2,995,179.

Laminated ski. H. Head. 2,995,379.

Bearing material. D. C. Mitchell and P. P. Love (to Glacier Metal). 2,995,462.

Adhesive tape. C. S. Webber and E. B. Lewis (to Norton). 2,995,467.

Impregnated paper. E. J. Sweeney, W. W. Toy, and P. J. McLaughlin (to Rohm & Haas). 2,995,472.

Linear polymer production. P. F. Warner (to Phillips) 2,995,530.

Polyethylene composition. H. C. Baker and E. E. Lewis (to Du Pont). 2,995,539.

Curing agent for urea resin. E. L. Kropa and G. E. Cremeans (to Esso). 2,995,541.

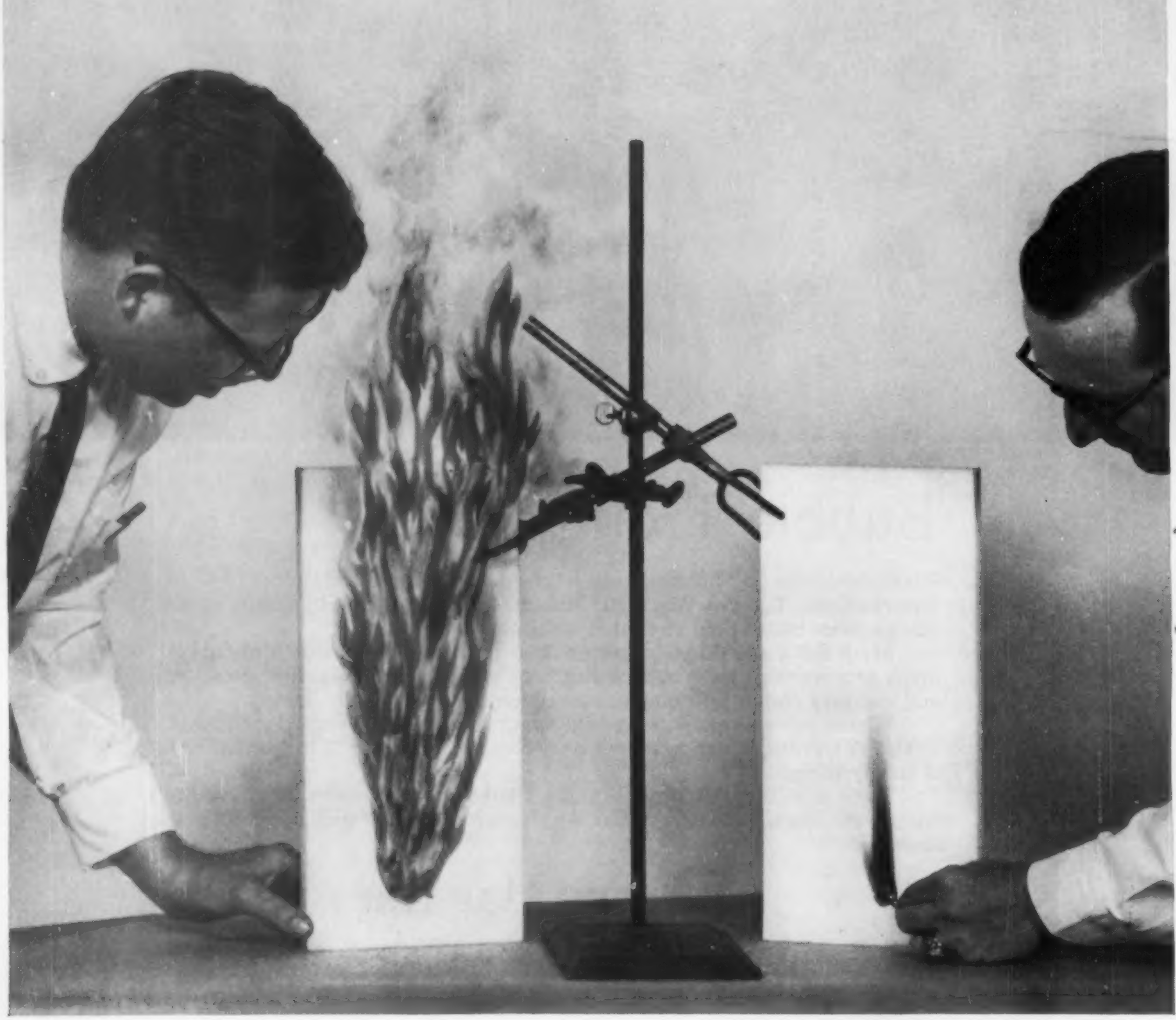
Fluorocarbon polymers. H. A. Brown (to 3M). 2,995,542.

Polymers of cyclobutene derivatives. J. K. Williams (to Du Pont). 2,995,543.—**End**

VIRCOL®

Without VIRCOL 82, the rigid urethane foam at left is destroyed by fire.

Made with VIRCOL 82, the rigid urethane foam at right forms char and extinguishes flame.



As a urethane catalyst, DABCO does a better job at less than half the concentration of conventional amines

DEPENDABLE HIGH ACTIVITY. DABCO is a far more active catalyst for both polymerization and gas generating reactions than any other known amine. However, during the critical first 15 seconds of flexible foam formation, reactions catalyzed with DABCO have a high exotherm rate while carbon dioxide evolution rate is comparatively low. This means that, at this stage, urethane polymerization is progressing much faster than gas generation—a very desirable condition in the production of one-shot foams.

ECONOMY. It is unwise to base economy on catalyst cost. Concentration, scrap loss, and consistent production of premium quality foam . . . these factors point the way to true economy and increased profit.

PLANT SAFETY. For your eyes' sake, choose an amine catalyst with care. Insist on a complete toxicity report. Full data on DABCO sent on request.

PERFORMANCE. More than 300,000,000 pounds of flexible and rigid urethane foams have been catalyzed with DABCO, the reliable catalyst chosen by foam producers in 22 countries.

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DABCO®: Houdry Process Corporation trademark for triethylenediamine. $C_6H_{12}N_2$

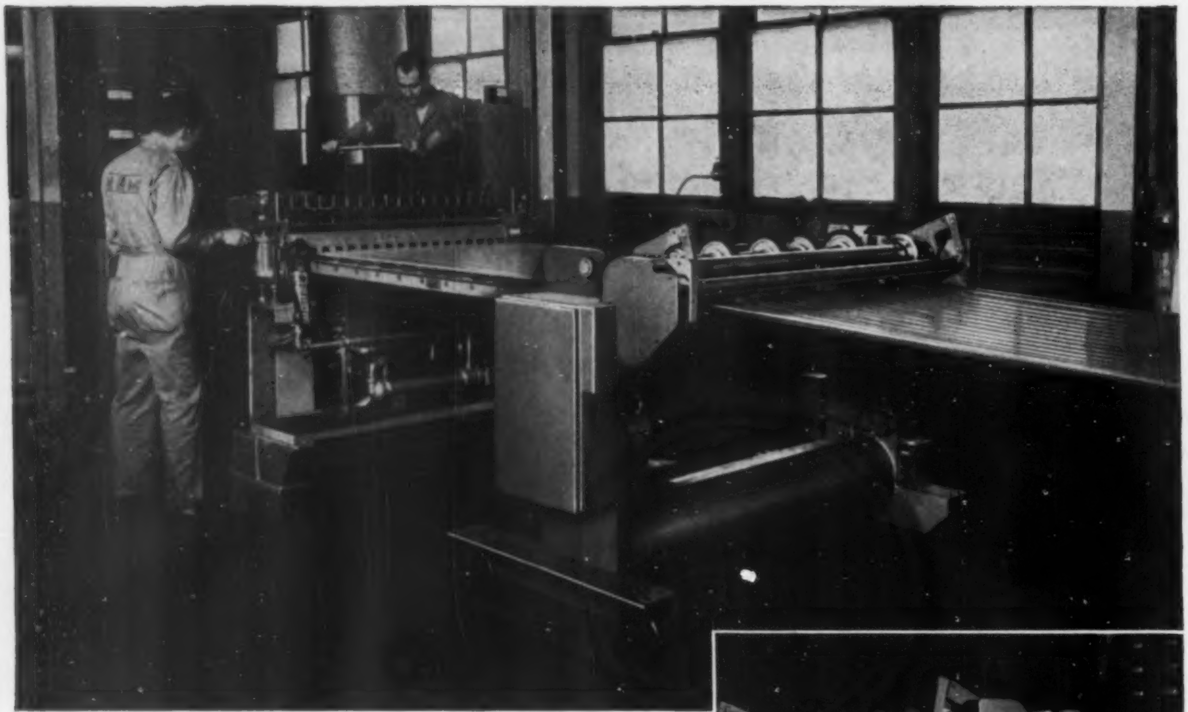
*HOUDRY

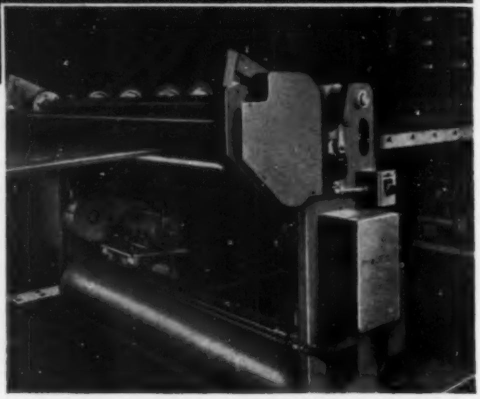
PROCESS CORPORATION

1528 Walnut Street, Philadelphia 2, Pa.

***Houdry means Progress...through Catalysis**

Patent Reference: The use of triethylenediamine as catalyst in production of polyurethanes is covered by U.S. Patent No. 2939851 issued to Houdry Process Corporation. Corresponding patents have been issued in a number of foreign countries. Other U.S. and foreign patent applications pending.





Unique, continuous extrusion of a corrugated translucent, vinyl sheet at National Rubber Machinery Company, Akron, Ohio. Pull Roll Stand (inset above) is powered by an Eaton fractional horsepower Ajusto-Spede® Drive.

DYNAMATIC® EDDY-CURRENT EQUIPMENT—

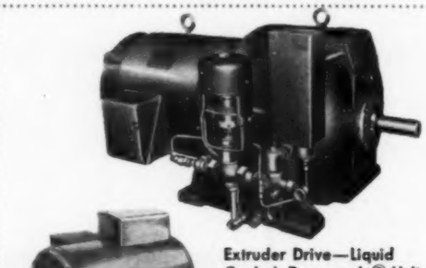
Provides greater economy with stepless, adjustable speed from standard AC power!

Compact, versatile Eaton-Dynamatic Eddy-Current Drives and Couplings have won widespread application acceptance in the plastics industry. Ability to provide stepless, infinitely adjustable speed with constant torque throughout the speed range of the drive from standard AC power, is a characteristic especially important to extrusion.

Rapid response, wide speed range, quiet operation, low power loss, low maintenance cost, absence of commutators, rings, brushes or rotating coils, and remote control are other good reasons for the selection of Eaton-Dynamatic drives.

Dynamatic Eddy-Current Equipment is available in various sizes rated from ¼ hp up to 20,000 hp—and larger to meet your need.

Bring your speed control problems to "Eddy-Current Headquarters". Expert representatives in all principal cities will provide a simple, economical solution.



Extruder Drive—Liquid Cooled, Dynaspede® Unit.

Pull Roll Stand Drive—Air-Cooled, 3 Phase Ajusto-Spede® Unit.

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DYNAMATIC DIVISION

MANUFACTURING COMPANY

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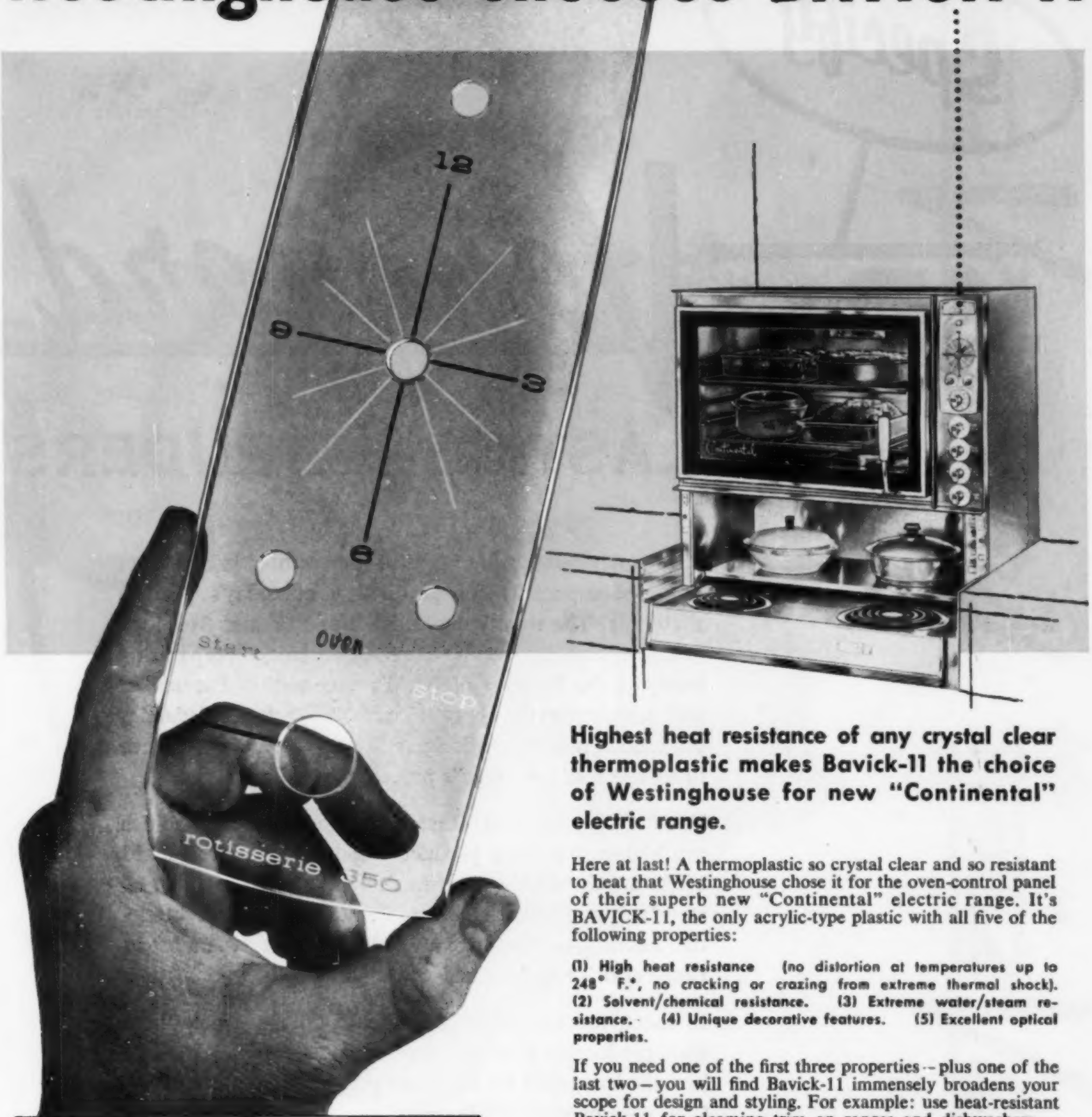
... YOUR PARTNER IN PROGRESS THROUGH RESEARCH...

Westinghouse chooses BAVICK®-11



Highest heat resistance of any crystal clear thermoplastic makes Bavick-11 the choice of Westinghouse for new "Continental" electric range.

Here at last! A thermoplastic so crystal clear and so resistant to heat that Westinghouse chose it for the oven-control panel of their superb new "Continental" electric range. It's BAVICK-11, the only acrylic-type plastic with all five of the following properties:

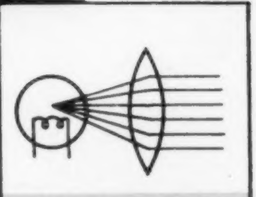
(1) High heat resistance (no distortion at temperatures up to 248° F.*, no cracking or crazing from extreme thermal shock). **(2) Solvent/chemical resistance.** **(3) Extreme water/steam resistance.** **(4) Unique decorative features.** **(5) Excellent optical properties.**

If you need one of the first three properties – plus one of the last two – you will find Bavick-11 immensely broadens your scope for design and styling. For example: use heat-resistant Bavick-11 for gleaming trim on ranges and dishwashers... to add functional sparkle to electric percolators and skillets ... for "piping" light and edge lighting ... for crystal clear gauges, knobs, dial faces and pointers ... for jewel-like perfume bottle stoppers ... and many other applications.

Bavick-11 is strong, tough and has good resistance to abrasion. It can be extruded and molded, is easily machined, cemented, colored, decorated, metallized, lacquered and printed.

May we send you literature about BAVICK-11? Write on your letterhead to Dept. MP-11.

BAVICK-11 ... unique properties for piping—Completely resistant to boiling water and low pressure steam, most acids, alkalies, alcohols and many other solvents. Extrudable, tough, free from odor, no loss of transparency in chemical atmospheres.



BAVICK-11 ... excellent optical properties for lenses — To replace glass in certain optical systems, Bavick-11 offers water-white crystal clarity, resistance to outdoor exposure, uniform index of refraction and high thermal resistance.

Plastics Division

J. T. Baker Chemical Co.

Phillipsburg, New Jersey

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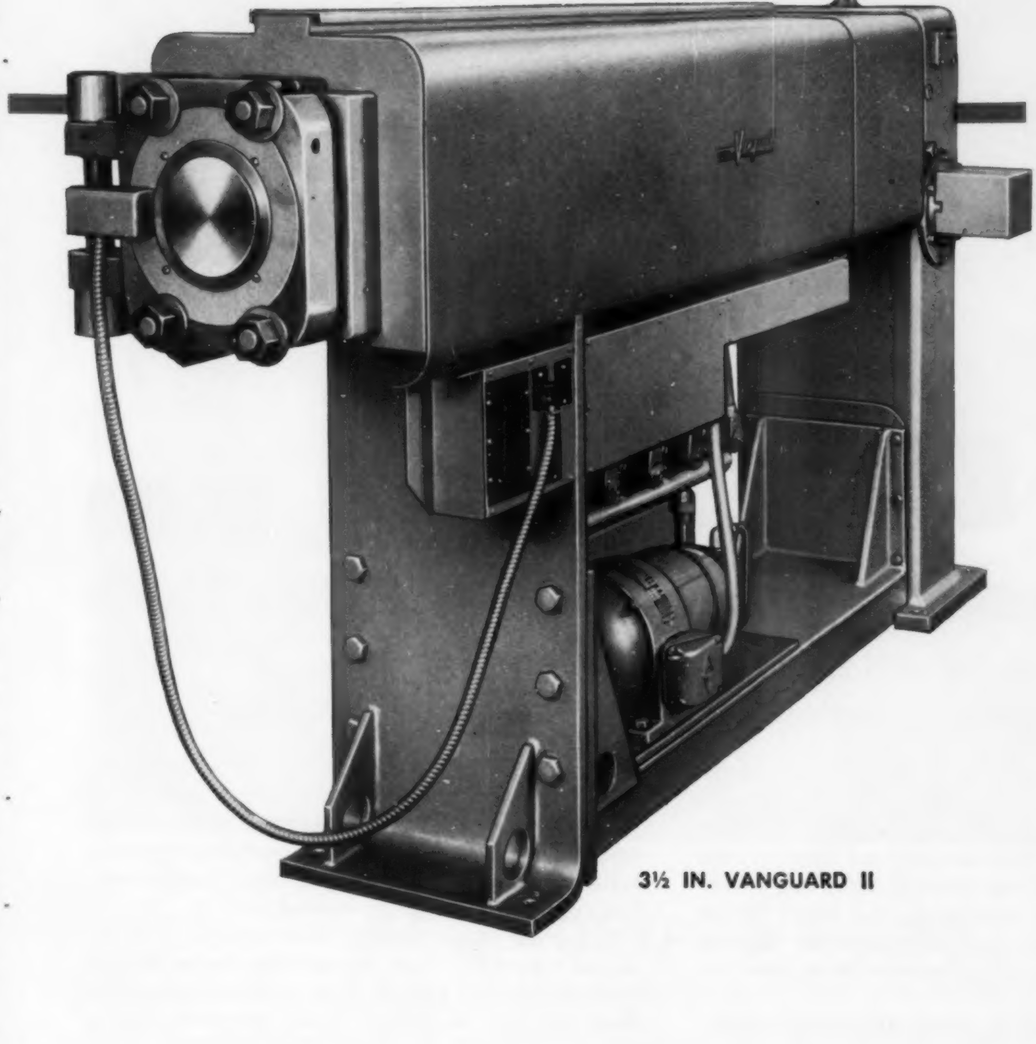
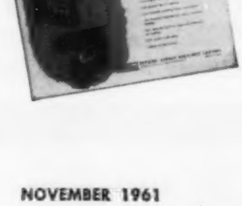
*ASTM Heat Distortion D648 264 psi loading

NRM Vanguard

NRM Vanguard



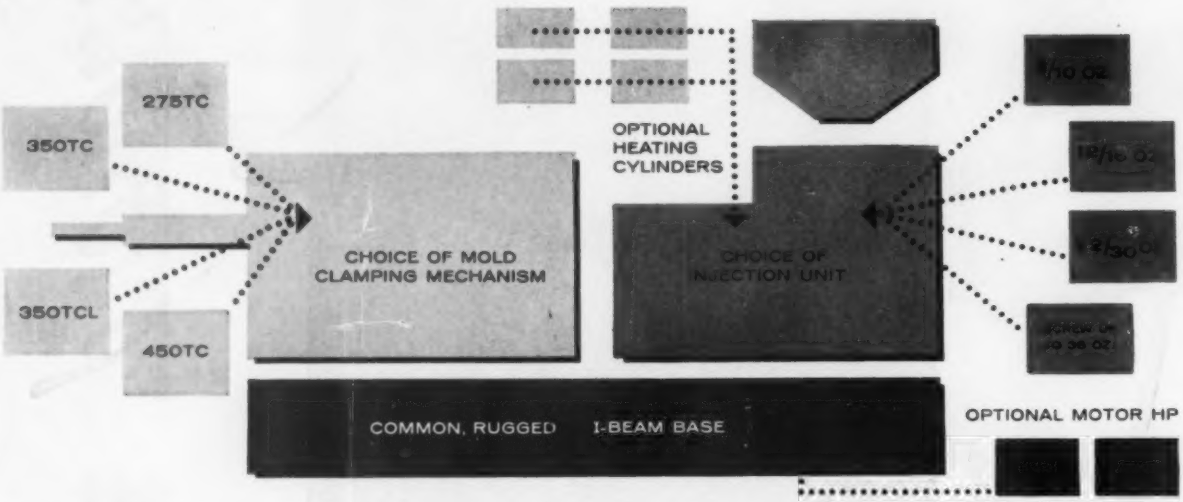
3½ IN. VANGUARD II



For complete information on the Vanguard Series, request Bulletin VG-200. Address National Rubber Machinery Company, 47 W. Exchange St., Akron 8, Ohio, Dept. MP-1161.

You specify what you need with the new

REED "building block" design



Choose from 20 different combinations . . . including a reciprocating screw or two-stage injection

You get more machine for your money when it's a REED "Building Block" injection molding unit. With this new modular design concept, you can choose from 20 different combinations of mold clamping and injection ends using a common base. You get what you've long wanted . . . the machine you need today that is still flexible enough to change with your needs, because "Building Block" units are fully convertible with the replacement of either end.

In addition to standard plunger-type injection ends, REED now offers (1) a reciprocating screw injection unit, or (2) a two-stage injection system. These units can be specified with any REED "Building Block" machine. The REED reciprocating screw gives you good color blending, faster material and color changes, more effective injection pressures and stronger molded parts.

To find out about "Building Block" design . . . its advanced features . . . and how you can choose the one machine that best satisfies your needs, call your REED Sales Engineer. He has full details and specifications.

REED-PRENTICE

Division of PACKAGE MACHINERY COMPANY

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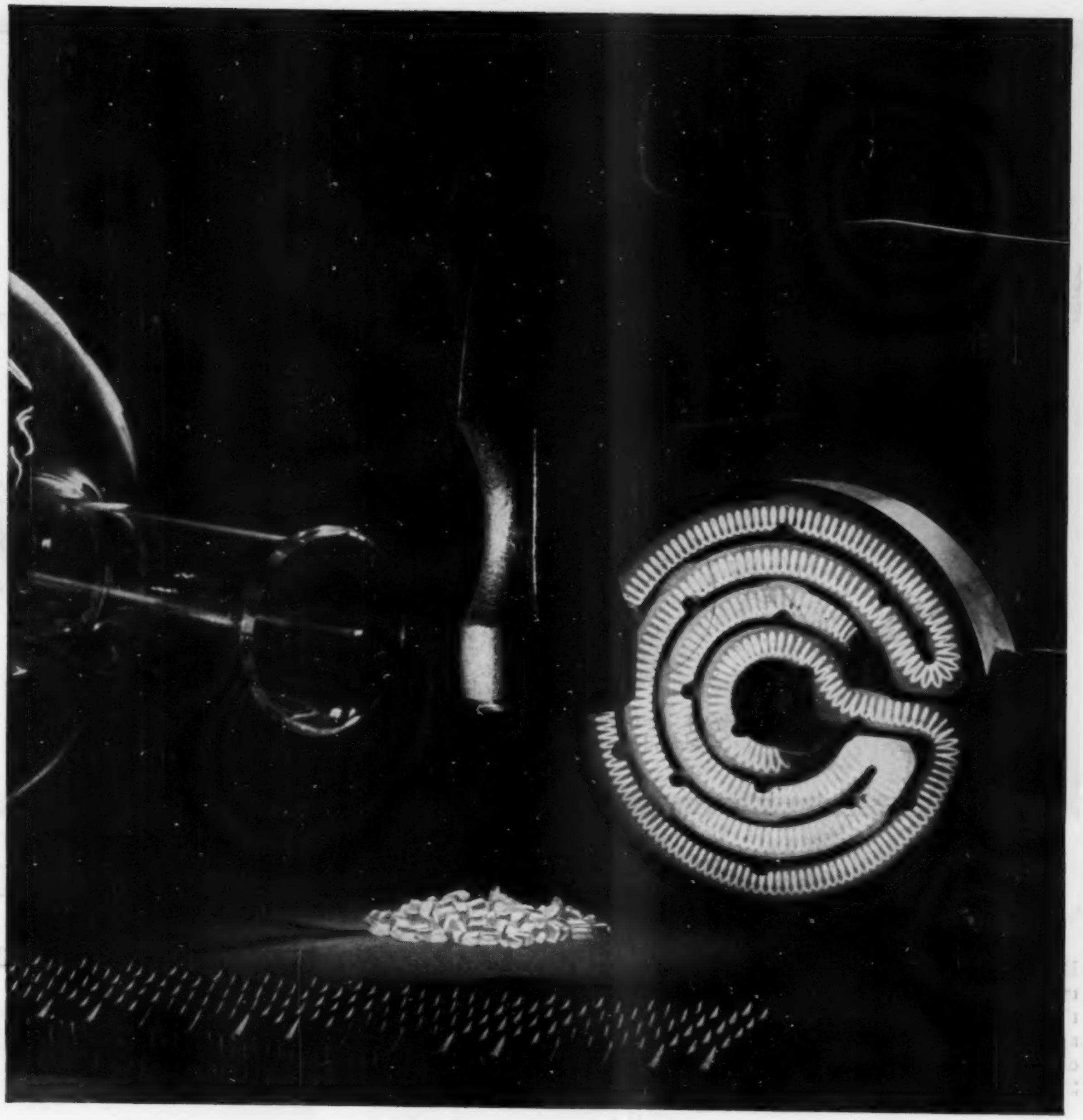
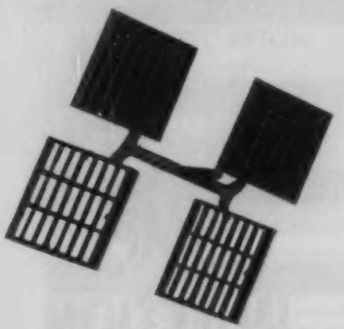
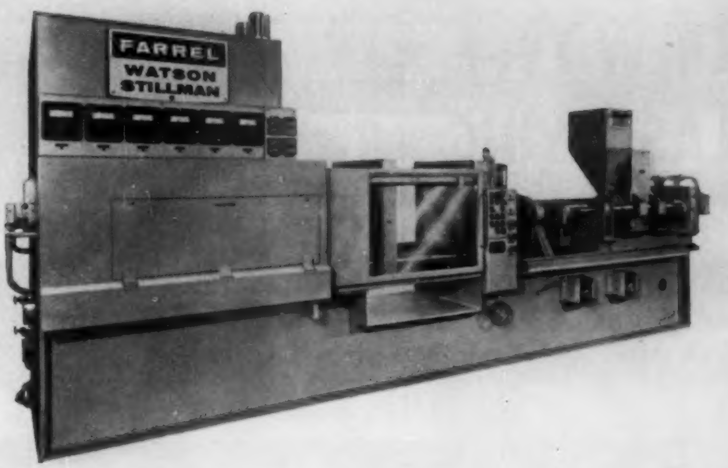


TRAY
Cycolac



AIR-CONDITIONER LOUVERS
polycarbonate



S-20-350 In-Line Screw Plasticizer Injection Molding Machine

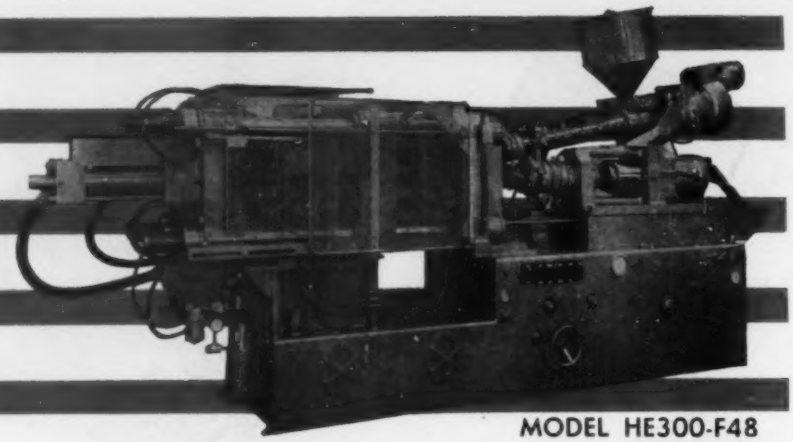
Maximum ounces per shot—(Styrene)	20
Plasticizing capacity of cylinder per hour (lbs. Styrene)	240
Shooting capacity (cu. inches per min.)	1290
Clamping capacity (tons)	350
Daylight opening (inches)	36
Clamp ram stroke (inches)	24
Maximum die sizes (inches)	20½x36

these screw-type machines

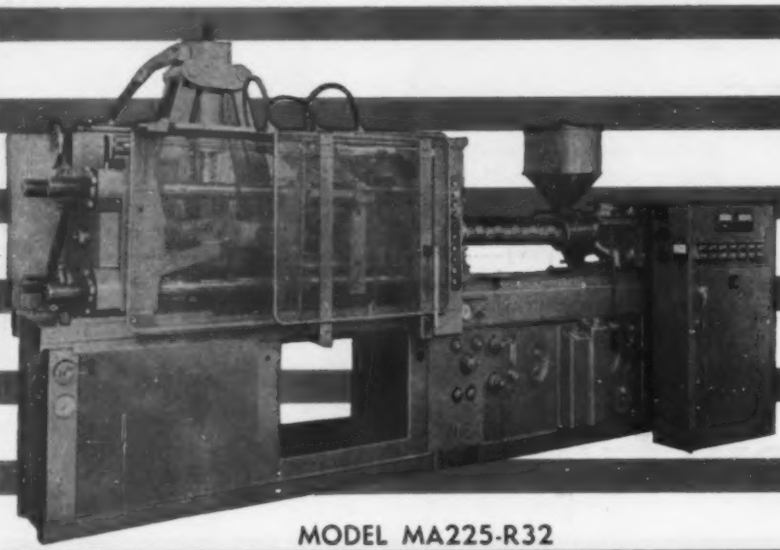
SP-300-2000 Screw Preplasticizer Injection Molding Machine

Maximum ounces per shot—(Styrene)	300
Plasticizing capacity of cylinder per hour (lbs.)	500
Shooting capacity (cu. inches per min.)	5680
Clamping capacity (tons)	2000
Clamp ram stroke (inches)	60
Daylight opening (inches)	108
Maximum die sizes (inches)	52x84

NOW—
SCREW-TYPE
PLASTIFYING



MODEL HE300-F48



ON IMPCO INJECTION MOLDING MACHINES

MODEL MA225-R32

To meet the needs of the plastic molding industry, Impco offers a complete line of screw plastifiers. Various design adaptions for this type of plastifying are now available on all of our machine models. Bulletins describing these adaptions as applied to Impco 175, 225, 275, 300 and 450 ton clamp models are on hand. Send for them today. We will be happy to discuss these and other significant improvements with you.

IMPCO®

IMPROVED MACHINERY INC.

NASHUA, NEW HAMPSHIRE

IN CANADA: SHERBROOKE MACHINERIES LIMITED, SHERBROOKE, QUEBEC
IN EUROPE: SUNDS VERKSTADER AB, SUNDSBRUK, SWEDEN

U.S.I. POLYETHYLENE NEWS

A series of advertisements for plastics and packaging executives by the makers of PETROTHENE® polyethylene resins

NOVEMBER, 1961 — U. S. Industrial Chemicals Co., Division of National Distillers and Chemical Corporation — 99 Park Ave., N. Y. 16, N. Y.

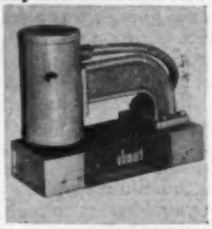
Packaging Notes

Laundry-grade polyethylene film is offered along with a choice of two sealing

units and a promotional kit to spur sales. This ultra-clear customized wrap, designed to replace kraft paper, boxes or cellophane, provides such advantages as: fast, foolproof inspection; increased sales appeal; all-weather protection.

CIRCLE (3) ON COUPON

Nuclear thickness gauge using beta radiation is currently available in a new small size. Measuring only 22 inches long and believed to be the simplest of its type, it will indicate or record thicknesses of sheet materials up to 12 inches wide. Unit is described as "relatively inexpensive . . . extremely useful in the laboratory determination of thickness or density of plastic films, paper, coated materials, and metal foils."

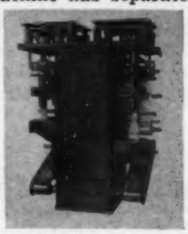


CIRCLE (4) ON COUPON

Diet bar, a new baked dietary food product, is packaged in carbon-dioxide atmosphere in a foil-and-polyethylene wrapper. Standard flavors are chocolate, lemon and spice. Three bars daily reportedly provide 1,248 calories.

CIRCLE (5) ON COUPON

New "form and fill" machine packages candies and IQF foods in polyethylene at speeds up to 150 units per minute. This double-tube machine has separate drives, permitting either of the two tubes to be operated independently of the other. It produces packages ranging in size from 2" x 3" to 8" x 14½" and handles polyethylene film or polyethylene coated substrates.



CIRCLE (6) ON COUPON

Polyethylene Uniquely Qualified For Nuclear Applications

As a Secondary Neutron Shielding Material, It's Unparalleled In Efficiency

There's no dearth of jobs for polyethylene in the nuclear field. It's the lightest of all materials effective against neutrons and, as such, is uniquely suited for use where space and weight are at a premium. In nuclear-powered ships, submarines and yet-to-be-built planes, for example, polyethylene plate is considered the ideal secondary neutron shielding material.

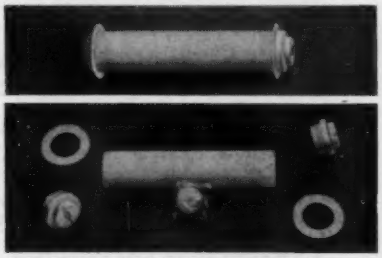
Why It Works

Polyethylene's effectiveness in nuclear operations lies in its ability to slow down the highly penetrating, fast moving, erratic neutrons. The best way to do this, it has been found, is to present a high concentration of light atoms as a barrier to their movement. Since hydrogen is the lightest atom, polyethylene, possessing four hydrogen atoms per monomer unit, has this capacity.

In addition, polyethylene offers: sufficient temperature resistance for most shielding applications; good dimensional stability and form retention; resistance to abrasion and impact; compatibility with other materials. It's also easy and economical to machine. And, it will not give off noxious gases in the event of fire.

Poundage Adds Up

While the number of reactor units is a limiting factor in the market for polyethylene shielding, individual installations do show large-scale use on a poundage basis. For instance, each nuclear submarine built today carries from 55,000 to 60,000 lbs. of polyethylene shielding; the merchant ship N.S. Savannah, 250,000 lbs.; and the guided missile cruiser U.S.S. Long Beach, 500,000 lbs. All of which puts the annual requirement of polyethylene sheet for shielding between 1½ and 2 million pounds!



Polyethylene "rabbit" houses chemicals to be irradiated as part of U.S.I.-sponsored nuclear research. Company's PETROTHENE resins are used to make reactor shielding for atomic powered vessels.

U. S. I. Spurs Use

Reactor shielding is only one way polyethylene participates in nuclear progress. Its applications at the Industrial Reactor Laboratories, Plainsboro, N. J., are typical. This facility is jointly owned by National Distillers and Chemical Corp.'s U.S. Industrial Chemicals Co. division and nine other companies which conduct radiation research related to their particular products.

Here, polyethylene containers known as "rabbits" transport test specimens through pneumatic tubes in and out of specific reactor zones. Polyethylene film protects materials and instruments from radioactive dusts. Polyethylene-coated paper protects floors against contamination. A polyethylene film sleeve encases and protects the mechanical arm of a hot cell manipulator at all times.

CIRCLE (1) ON COUPON

Polyethylene Window Posters Fold Down to Envelope Size

Open — it's a colorful 3' x 3' sign ready for posting; closed — it fits into a 10" x 12" envelope. And, because it's of lightweight flexibile polyethylene film, this window display piece can be mailed without stiffener at very low cost. A New Jersey firm designs and produces the small billboards in sizes up to 72" x 72".

CIRCLE (2) ON COUPON

WANT MORE INFORMATION

. . . on items mentioned in Polyethylene News? Just circle key no. of developments in which you're interested and mail to U.S.I. Polyethylene News, U.S. Industrial Chemicals Co., 99 Park Avenue, New York 16, N. Y.

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NPL.

Series VI, No. 6

POLYETHYLENE PROCESSING TIPS

ELIMINATING EXCESSIVE BLOCKING IN POLYETHYLENE FILMS AND COATED SUBSTRATES

Blocking – the tendency of a film or coated substrate to adhere to itself or, in some cases, to another surface – plagues many polyethylene extruders and converters. Yet even where blocking is excessive, it can be eliminated in most cases.

Slip and Antiblock Formulations

Primary method for reducing blocking is the incorporation of slip or antiblock formulations in the resin by the polyethylene resin supplier. U.S.I., for example, tailors such additive formulations to various applications and extrusion conditions. These additives are designed to exude to the surface, or "bloom", after extrusion, imparting antiblock characteristics to the film or coating.

To understand how these formulations work, consider what happens when two polyethylene surfaces are in contact. (See Figure 1.) At room temperature, with no pressure on either film, the two films have relatively few areas of actual contact due to their microscopically rough surfaces. However, as temperature or pressure, or both, increase, plastic flow and elastic deformation occur. This increases the area of real contact, causing an increase in the two films' natural attraction for each other – i.e., blocking.

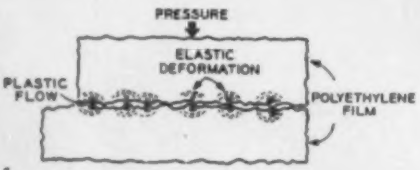


Figure 1.

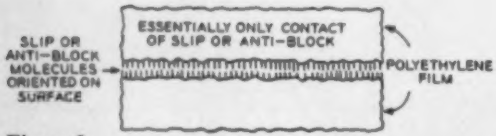


Figure 2.

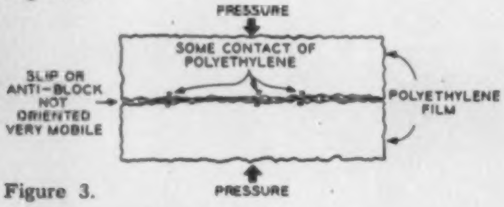


Figure 3.

However, films produced from resins containing slip or antiblock agents have a coating of non-blocking molecules oriented on their surfaces. (See Figure 2.) At room temperature, these molecules virtually eliminate contact between the polyethylene surfaces, giving the film the low blocking characteristics of the additive used. As temperature and pressure rise, the slip or antiblock molecules become very mobile and are no longer oriented, permitting some polyethylene-to-polyethylene contact. (See Figure 3.) Still the area of contact is kept to a minimum by the slip or antiblock agents, and unless relatively high temperature and pressure limits are reached, there should be no blocking problem.

Effect of Film Smoothness and Density

Other film characteristics affecting blocking are film smoothness and density. Very smooth, glossy films have a greater area of contact, and hence, greater blocking tendencies. Higher-density films have harder surfaces and are not so easily deformed. Consequently, they have less tendency to block, all other factors being equal.

Effect of Processing Variables

Processing conditions that produce higher film temperatures or greater pressure on films in contact, will increase blocking. Key processing variables in this respect are extrusion temperature, film cooling, windup tension and, in blown film, nip roll pressure.

Increasing extrusion temperatures may affect blocking two ways: 1. Produce higher film temperatures, and 2. Volatilize the slip or antiblock additives at the extrusion die. Either can cause blocking. Adequate cooling of the film is a countermeasure.

High-tension windup affects blocking by causing pressure on the film roll. The higher the film temperature at windup, naturally, the greater this effect.

Equally important – although applicable only to blown film – is the pressure on the film at the nip rolls. Since these rolls press the blown tube together at a point much closer to the die than the windup unit, they can influence internal blocking of the tube more than windup tension. However, if extrusion temperature is not excessive and cooling is sufficient, no problems should occur at the nip rolls when pressure is held near the minimum necessary to maintain a constant air volume in the "bubble".

Other Factors Affecting Blocking

Film gauge influences blocking too. Thin-gauge films are more susceptible to static electricity buildup and more difficult to separate due to their flimsiness. Any conditions favoring static buildup, of course, add to blocking. Also thinner films run at higher take-off speeds, with hotter windup and higher tension, increases the blocking tendency.

Unfavorable environmental conditions during extrusion or storage can also cause blocking. High room temperature warms the film, while stacking rolls or sheets of film or coated stock creates high pressure. Very low temperatures, on the other hand, may cause film shrinkage and resultant blocking.

When you have excessive blocking, first check your operation to see if modifying extrusion conditions can eliminate it. If blocking cannot be eliminated, consult your resin supplier. U.S.I. technical service engineers are available to help you find and eliminate problem areas.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.
Branches in principal cities

MODERN PLASTICS

November 1961 Volume 39, Number 3

Lesson in *Creative* public relations

A year ago the Society of the Plastics Industry Inc. was invited by the organizers of the National Automobile Show at Cobo Hall, Detroit, to accept space in which to exhibit on behalf of the entire Plastics Industry a display showing present and possible applications of plastics in automobiles.

The idea had many things in its favor: 1) the show was open to both public and industry; 2) the display could be hoped to sell car owners on the advantages accruing to them through the increased uses of plastics, and thereby help automobile makers sell cars with more plastic content; 3) since so many kinds of plastics are used in cars, the element of competition between plastics was avoided by the industry-wide display; 4) the exhibit could allow for explanatory card copy to help educate the public; and 5) the cost was low—about $45,000.

The S.P.I. Board of Directors authorized the Public Relations Committee to proceed with the project. It turned out to be a fabulous and practical presentation, seen by 74,198 adults clocked at the automobile show and by another 34,875 at the National Plastics Exposition last May.

Results of such an activity are always intangible, and, since the automobile industry designs and specifies two to three years in advance of production, may be slow in coming. But as our cover story (next page) indicates, in this case action on plastics was actually speeded up, and increased application is seen even in the 1962 models. Indeed, there are reports that some uses projected for 1963 were incorporated into 1962 cars because of all the proper publicity.

The Plastics Industry must have more such cooperative and creative exposure in the automotive, building, home appliance, packaging, and furniture fields and in others. This is the way to build new business for everybody in our industry. It is a lot less costly than trying to use public relations to put out the fires of public complaint. Positive public relations, based on truth, always improves the markets for all.

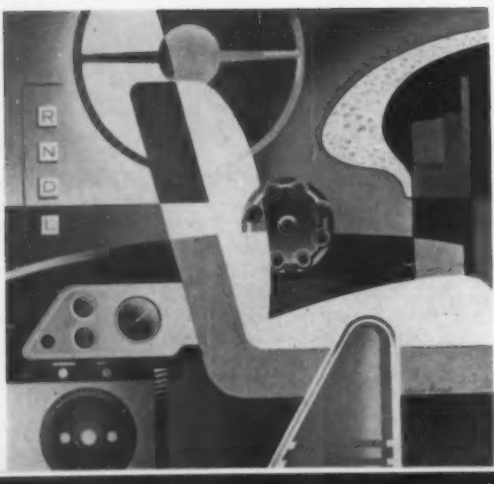
Detroit: 1962 BIG PARTS for NEW CARS

Estimates place resin consumption for the 1962 model year at 25 lb. per car. Assuming a 6-million-car year, this represents 150 million lb. of material—not counting upholstery, finishes, and film for safety glass. Seventeen different plastics are involved in this total, and they go into about 170 different parts. Roughly 30% of total poundage is used in functional components, the remainder for interior trim and decoration. These are impressive figures. But they only represent plastics' jumping off point. By 1965, plastics consumption is expected to reach 45 lb. per car.

One major clue to this phenomenal growth lies in the trend to specify plastics for large parts. To the plastics industry, this trend carries major significance: once the concept of large plastics parts has been successfully adopted by the automotive industry (often called plastics' proving ground), acceptance by other industrial segments can be expected to follow soon.

Instrument clusters

At least two such clusters (Chrysler Valiant and Buick Special) were introduced on the 1961 models—one injection molded of Delrin acetal resin, the other of Kralastic ABS (acrylonitrile-butadiene-styrene) material. For 1962, these



COVER: Even our artist's conception of plastics applications in automobiles could not keep up with Detroit and the major new uses unveiled along with the 1962 models.

clusters are being carried over, basically unchanged. Others are making their debut.

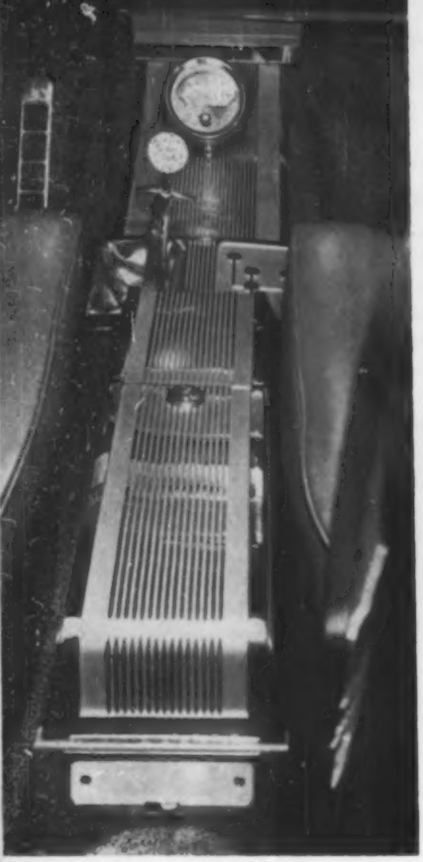
Their advantages, as compared to die-cast zinc, aluminum, or magnesium units, include lower tooling costs, weight savings of as much as 80%, virtual elimination of finishing operations, and much greater latitude of design. In a plastic cluster, a single-molded part may incorporate such features as light traps, retainers for bulb sockets, inherent color for improved illumination of instrument dial faces, and built-in electrical insulation.

One of the most interesting clusters, developed by the AC Spark Plug Div. of GM for the company's '62 cars, is the printed circuit case for the standard-sized Buicks. This component, injection molded of Kralastic K-2938 high-heat-resistant ABS material, incorporates an injection-molded impact acrylic insert painted black on the front surface. It also includes some use of nylon and Delrin acetal materials in the lamp mounting sockets which insert through the back of the case.

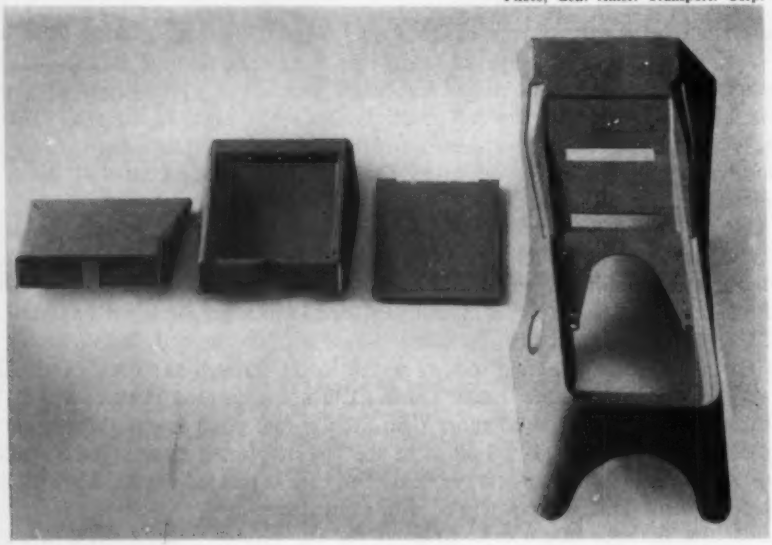
AC representatives state that, if plastics had not been used in this part, its production would have involved more than 30 separate components. Measuring approximately 18 in. long, it is said to be the largest printed circuit-type instrument case used to date in the automotive field. The case is molded for AC by Champion Molded Plastics Inc., Bryan, Ohio, with printed circuitry applied to the back of the part by Methode Mfg. Corp., Chicago, Ill. The printed circuit, which eliminates the familiar "rat's nest" of wires behind the dashboard and greatly expedites installation on the assembly line, is a new type involving application of a die-cut sheet of Mylar polyester film which carries the metallic circuitry. The film has a layer of pressure-sensitive adhesive on the back and is pressed into position on the back of the molded ABS housing.

The newly introduced Chevy II car uses a cluster injection molded of impact acrylic (Implex), vacuum metallized on the front surface, and combined with a transparent acrylic face plate. The bezel or housing, molded in a basic grey color,

TONNEAU COVER of RP (color) is feature of Thunderbird sports roadster. Easily installed and removed, lightweight (27 lb.) molding converts 4-seater into racy-looking 2-seater.



Photo, Gen. Amer. Transport. Corp.



CONSOLES, set between popular bucket seats, have meant an important new market for plastics. That of Pontiac Grand Prix (left) and Oldsmobile Starfire (above) are both injection molded of ABS. Olds unit consists of cover, glove box, and glove box door all mounted within a main housing.

receives a base coat applied by means of a flow-coating process in AC's recently installed plastic molding and finishing facility at Flint, Mich. The part is then vacuum metallized and top-coated.

On the 1962 Plymouth cars, the instrument cluster is comprised of two injection-molded parts —a main housing of Cycolac ABS material, measuring approximately 20 in. long by a maximum of 7 in. from top to bottom, and a transparent acrylic part including five dial crystals, which mounts behind it. Molded in white, the ABS part is vacuum metallized on the entire front surface. By means of eight projecting studs on the back of the housing, which insert through cored openings in the acrylic component, the two parts are permanently heat staked together. Prior to this assembly, the acrylic part is painted white except for the dial crystal areas, which are left clear. This cluster is used in conjunction with printed circuitry, adopted for the first time by Plymouth for its 1962 models.

The 1962 Ford instrument panel assembly includes an injection-molded transparent acrylic face plate, more than 20 in. long, having speedometer numerals and other calibrations molded into the back. These markings, as well as the back surface of the bezel area, are painted, while the front surface is vacuum metallized around the dial crystal bezels and the entire framed edge of the part. Here again, the industry trend to high-quality, first-surface metallizing is clearly evident.

Wheel housing covers

Polyethylene reigns supreme in this application. Two excellent examples are the new one-piece combination wheel housing covers and rear-quarter panel liners that have been adopted for Rambler and Chrysler Corp.'s Plymouth and Dodge station wagons.

The Rambler panels, weighing about 3 lb. each and measuring approximately 5 ft. long from front to back, with an average wall section of 0.070 in., are injection molded in the American Motors Plastics Div. plant at Evart, Mich., of 0.945-density, 8.0-melt index copolymer material (Bakelite DPD-7070) using a 200-oz. HPM injection machine equipped with preplasticator. Production is said to run around 100 pieces per hour, using a single-cavity mold for each panel (left and right). A long flash-type runner, feeding from the bottom, facilitates complete filling of the part. Installed quickly by means of metal fasteners, it replaces a combination fiberboard-fabric panel which required a number of costly stitching, cementing, and other assembly operations.

The Chrysler Corp. panels are thermoformed

by Woodall Industries Inc., Detroit, Mich., using a rotary forming machine. Panels are formed two up (matching left and right), beginning with a sheet measuring 76 by 95 inches. The sheet stock, extruded by Woodall in the same plant, is made with a grained finish on one side. These panels are also available in ABS material.

Consoles go plastic

The popularity of bucket seats has given rise to the concept of consoles—and led to a broadened market base for plastics. Significantly, in developing their consoles, automotive companies specified plastics as their first choice. There was no question of redesign, switch, or substitution. Consoles range from relatively simple units housing a storage container or box (usually linear PE) to sizable, elaborate parts incorporating storage space, ash trays, gear shift levers, and miscellaneous instruments and controls. Vinyl-metal laminates, reinforced polyester, and injection-molded plastics have moved strongly into this area.

The 1962 Olds F-85 console unit (see photo, p. 84) is actually an assembly of several injection-molded ABS components. The largest of these components, approximately 27 in. long, 14 in. wide and 12 in. high, weighs 2½ lb. and is produced on a 200-oz. injection machine. Mold inserts are used so that the part can be adapted for use with automatic transmission or "stick shift" installations. Included in the unit are a glove box and door which are also molded of ABS; total weight of the plastic console parts exceeds that of the 3 lb. of the unit introduced in 1961.

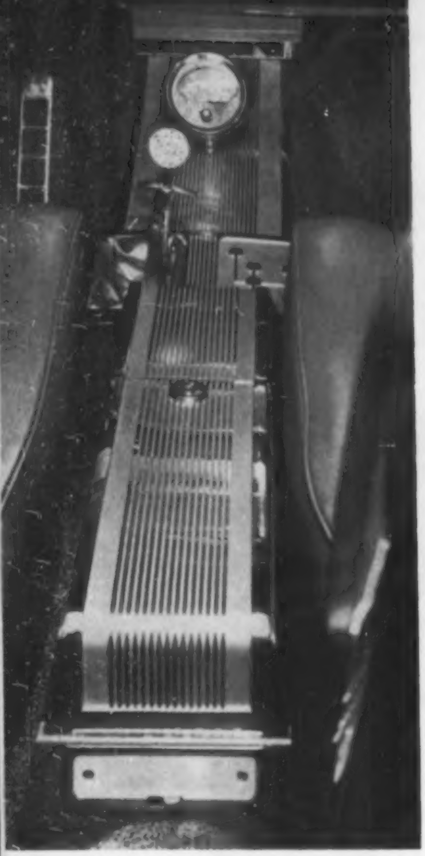
The 1962 Pontiac Grand Prix, also incorporates a large injection-molded ABS control console, made in parts, which assemble into the finished unit (photo, p. 84). It is produced by the Panelyte Div., St. Regis Paper Co., Dexter, Mich.

Consoles in the Studebaker Lark and the Studebaker Gran Tourisimo Hawk are molded of reinforced plastic and upholstered with vinyl.

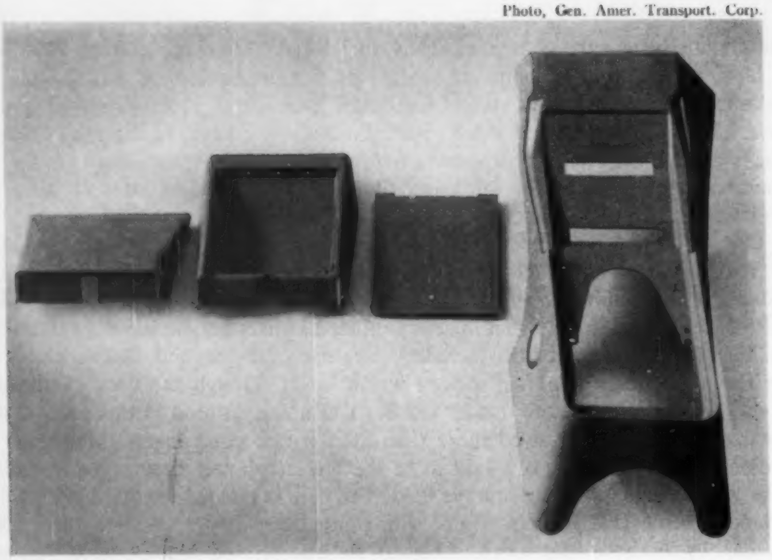
For sports car exteriors

For its newly introduced 1962 Thunderbird sports roadster, Ford developed a molded rein-

WHEEL HOUSING covers, used in interior of Dodge-Plymouth wagons, are thermoformed in pairs from a single sheet measuring 76 by 95 inches. Parts are made from either ABS or high-density PE.



Photo, Gen. Amer. Transport. Corp.



CONSOLES, set between popular bucket seats, have meant an important new market for plastics. That of Pontiac Grand Prix (left) and Oldsmobile Starfire (above) are both injection molded of ABS. Olds unit consists of cover, glove box, and glove box door all mounted within a main housing.

receives a base coat applied by means of a flow-coating process in AC's recently installed plastic molding and finishing facility at Flint, Mich. The part is then vacuum metallized and top-coated.

On the 1962 Plymouth cars, the instrument cluster is comprised of two injection-molded parts —a main housing of Cycolac ABS material, measuring approximately 20 in. long by a maximum of 7 in. from top to bottom, and a transparent acrylic part including five dial crystals, which mounts behind it. Molded in white, the ABS part is vacuum metallized on the entire front surface. By means of eight projecting studs on the back of the housing, which insert through cored openings in the acrylic component, the two parts are permanently heat staked together. Prior to this assembly, the acrylic part is painted white except for the dial crystal areas, which are left clear. This cluster is used in conjunction with printed circuitry, adopted for the first time by Plymouth for its 1962 models.

The 1962 Ford instrument panel assembly includes an injection-molded transparent acrylic face plate, more than 20 in. long, having speedometer numerals and other calibrations molded into the back. These markings, as well as the back surface of the bezel area, are painted, while the front surface is vacuum metallized around the dial crystal bezels and the entire framed edge of the part. Here again, the industry trend to high-quality, first-surface metallizing is clearly evident.

Wheel housing covers

Polyethylene reigns supreme in this application. Two excellent examples are the new one-piece combination wheel housing covers and rear-quarter panel liners that have been adopted for Rambler and Chrysler Corp.'s Plymouth and Dodge station wagons.

The Rambler panels, weighing about 3 lb. each and measuring approximately 5 ft. long from front to back, with an average wall section of 0.070 in., are injection molded in the American Motors Plastics Div. plant at Evart, Mich., of 0.945-density, 8.0-melt index copolymer material (Bakelite DPD-7070) using a 200-oz. HPM injection machine equipped with preplasticator. Production is said to run around 100 pieces per hour, using a single-cavity mold for each panel (left and right). A long flash-type runner, feeding from the bottom, facilitates complete filling of the part. Installed quickly by means of metal fasteners, it replaces a combination fiberboard-fabric panel which required a number of costly stitching, cementing, and other assembly operations.

The Chrysler Corp. panels are thermoformed

by Woodall Industries Inc., Detroit, Mich., using a rotary forming machine. Panels are formed two up (matching left and right), beginning with a sheet measuring 76 by 95 inches. The sheet stock, extruded by Woodall in the same plant, is made with a grained finish on one side. These panels are also available in ABS material.

Consoles go plastic

The popularity of bucket seats has given rise to the concept of consoles—and led to a broadened market base for plastics. Significantly, in developing their consoles, automotive companies specified plastics as their first choice. There was no question of redesign, switch, or substitution. Consoles range from relatively simple units housing a storage container or box (usually linear PE) to sizable, elaborate parts incorporating storage space, ash trays, gear shift levers, and miscellaneous instruments and controls. Vinyl-metal laminates, reinforced polyester, and injection-molded plastics have moved strongly into this area.

The 1962 Olds F-85 console unit (see photo, p. 84) is actually an assembly of several injection-molded ABS components. The largest of these components, approximately 27 in. long, 14 in. wide and 12 in. high, weighs 2½ lb. and is produced on a 200-oz. injection machine. Mold inserts are used so that the part can be adapted for use with automatic transmission or "stick shift" installations. Included in the unit are a glove box and door which are also molded of ABS; total weight of the plastic console parts exceeds that of the 3 lb. of the unit introduced in 1961.

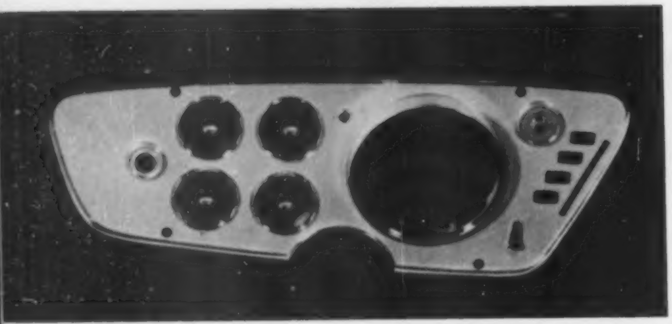
The 1962 Pontiac Grand Prix, also incorporates a large injection-molded ABS control console, made in parts, which assemble into the finished unit (photo, p. 84). It is produced by the Panelyte Div., St. Regis Paper Co., Dexter, Mich.

Consoles in the Studebaker Lark and the Studebaker Gran Tourisimo Hawk are molded of reinforced plastic and upholstered with vinyl.

For sports car exteriors

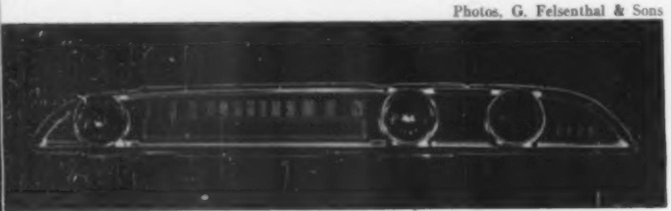
For its newly introduced 1962 Thunderbird sports roadster, Ford developed a molded rein-

WHEEL HOUSING covers, used in interior of Dodge-Plymouth wagons, are thermoformed in pairs from a single sheet measuring 76 by 95 inches. Parts are made from either ABS or high-density PE.



CLUSTERS are a growing trend—growing in popularity, size, and range of plastics used. Unit for new Plymouths has metallized ABS face with painted acrylic back plate heat-staked to it.

Photos, G. Felsenthal & Sons



FORD CLUSTER face plate is composed of single molding of clear acrylic. Molded-in lettering and numerals are back-painted and borders of front surface are metallized.

forced plastics tonneau cover (see photo, p. 83). The cover quickly converts the four-seater car into a rakish two-seat model. Placed over the entire rear portion of the passenger compartment, the cover need not be removed when the top is raised. Its center portion is depressed, in keeping with the car's interior styling. Two pockets at the front make it possible to fit the cover over the back of the front seats. It is easily lifted off when desired. Produced by the Industrial Products Div. of General Tire & Rubber Co., Marion, Ind., the tonneau cover weighs 27 lb. ready to install.

In another interesting exterior application of plastics, the 1962 T-Bird is also offered in a new Landau model having a distinctive vinyl-covered metal roof, available in choice of black or white. Use of the grained vinyl covering, which is bonded directly to the steel roof with a layer of padding between, gives the car the appearance of a convertible. The vinyl surface is weather- and stain-resistant and may be easily kept clean with an occasional washing.

The big parts are this year's trend setters. But they are not the only news about plastics in 1962 cars. Some of the progress made in smaller parts is indicated below. Spectacular advances have been made in electrical applications. These will be reported on in a forthcoming issue.

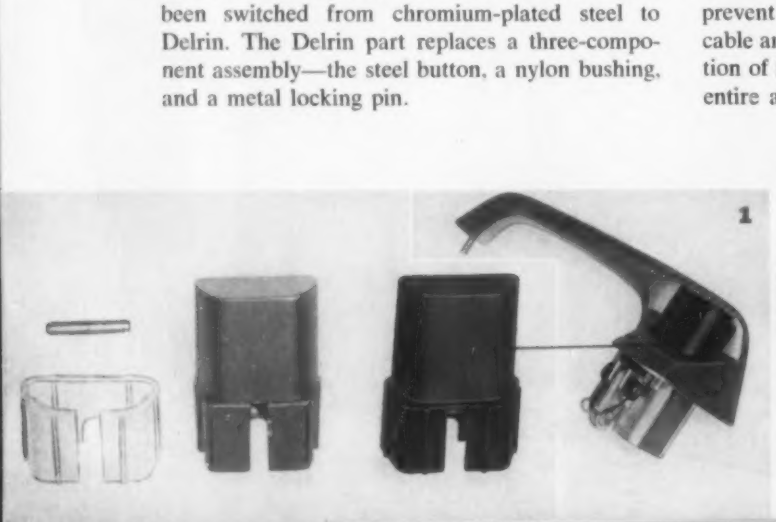
. . . and small parts, too

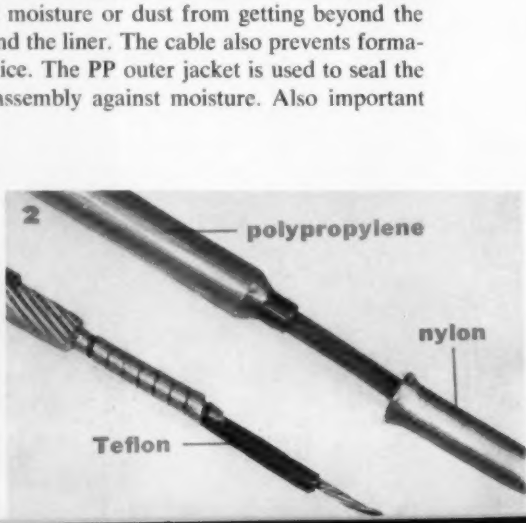
WHILE THE BIG NEWS for plastics in the 1962 automobile is in large parts, there has also been notable progress in a goodly number of less spectacular components. These applications, in terms of economics, design concepts, and performance, provide a veritable blueprint of sophisticated plastics usage.

Here are some of them:

1. Door latch buttons for all 1962 Valiants have been switched from chromium-plated steel to Delrin. The Delrin part replaces a three-component assembly—the steel button, a nylon bushing, and a metal locking pin.

2. Polypropylene, nylon, and Teflon were used to redesign the standard throttle cable assembly, which previously consisted of conventional mechanical linkages made up of rods and hinge joints. A stainless steel cable slides through a Teflon liner backed up by spirally-wound steel ribbon, then by strand wires, and finally by a PP outer jacket. At one end, a nylon shield is assembled to the end of the stainless steel cable to prevent moisture or dust from getting beyond the cable and the liner. The cable also prevents formation of ice. The PP outer jacket is used to seal the entire assembly against moisture. Also important





HERE ARE THE LARGE PLASTICS PARTS IN 1962 CARS

Car	Application	Material	Prod. Method	Features
Chevrolet (Chevy II)	Instrument cluster	**Impact acrylic and acrylic**	Inj. molding	First surface metallizing
Buick	Instrument panel case and inserts	**ABS, impact acrylic, nylon, acetal**	Inj. molding	Largest automotive printed circuit to date. Construction eliminates need for assembly of over 30 parts
Valiant	Instrument cluster	**Acetal**	Inj. molding	Weighs 2 lb.; one of first uses for this material in auto industry
Plymouth	Instrument cluster	**ABS, acrylic**	Inj. molding	Measures 20 in. wide and 7 in. deep
Rambler wagon	Cargo liner panels	**High-density polyethylene**	Inj. molding	Weight, 3 lb. each. Grained, non-scuff finish. Replaces more costly fiber-board-cloth assembly
Chrysler wagon	Rear quarter panel liners	**High-density polyethylene**	Thermo-forming	Formed two-up from extruded 76- by 95-in. sheet-grained finish
Oldsmobile & Pontiac	Control console housings	**ABS**	Inj. molding	Large parts, 3 lb. or more. Integral grained surface for appearance and scuff resistance
Thunderbird sports roadster	Rear tonneau cover	**Fibrous glass-polyester**	Comp. molding	Covers rear seat; painted to match car. Upholstered head rests. Stores in trunk

in the selection of PP was the material's good heat and abrasion resistance.

3. Complicated transfer-molded part made from glass-filled alkyd material, and used in the 1962 Chrysler line, replaces a total of 34 parts, individually produced, that were formerly used in these assemblies. The one-piece molding allows closer dimensional tolerances, and its non-conductive character allows brush guides to be made wider. Both these factors are important in maintaining the brush life at the motor speed of the new models—approximately 2.3 times as high as in previous years.

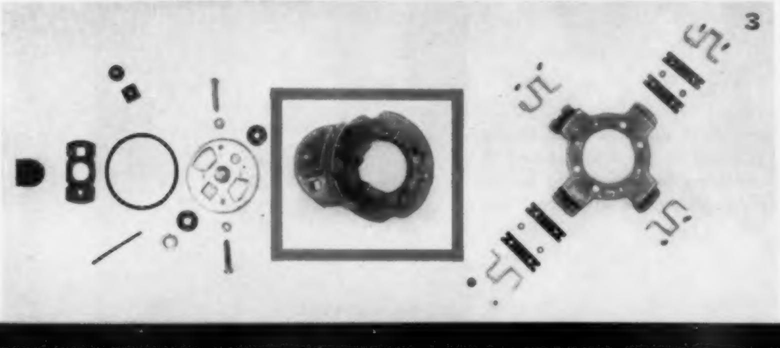
4. Injection-molded elastomeric vinyl heel pads, replacing rubber pads formerly used, are making their appearance in a number of 1962 cars, including the entire GM line. Prime reasons for their adoption: women's spike heels chew up rubber mats in a matter of weeks.

And also:

- Injection-molded ABS garnish molding, introduced by American Motors last year, is continued in the 1962 models. ABS has also been specified for armrests on various GM models, and on Mercury. Significantly, injection-molded ABS instrument panel end caps for the Buick Special are used as molded, with their color exposed.
- A glove compartment, molded of styrene copolymer material, and flocked to a luxurious finish, is used in the 1962 Cadillac.—**End**

Photos, Chrysler (1,2,3) and GM

3



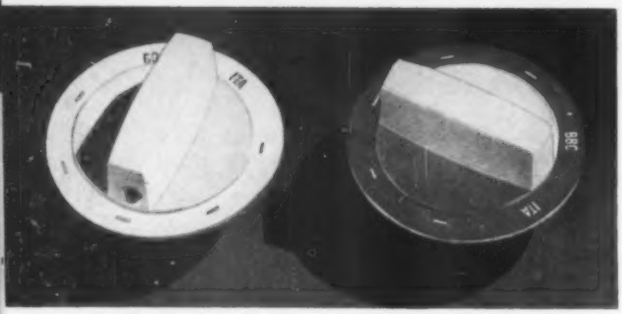
4

1 **Design flexibility** inherent in use of foils is attested to by one-piece dishwasher knob produced in white or cream urea and decorated during molding with foils printed in blue or gray lettering. Knob previously used was two-part assembly molded of transparent styrene and sprayed on the reverse side with two colors.

New approach to

In the decoration of quality melamine dinnerware, the use of molded-in colorful foils has already proved its commercial value—so much so that in today's market more than 80% of such dinnerware is decorated in this fashion. Less well known, however, are the strides being made in adapting the foil technique to a not-so-glamorous, but probably equally important, industrial chore: the marking and decorating of urea or melamine knobs, dials, nameplates, and handles for appliances and machines of all types.

When one considers the requirements for products of this nature, the transition of foiling from the consumer to the industrial field has much logic behind it. Since the numbers, letters, or color codes used on knobs and dials, for example, are printed directly on the foil before it is molded-in, a high degree of accuracy is insured. The scope of design possibilities, by the same token, is considerably broadened and, because the printed foil is molded-in *under* the surface of the part, the possibility of the markings being rubbed or scratched



2 **Same mold**—two different knobs. The secret? Simply change the foils and the color of the molding powder. The knobs shown above are only two out of a series of six different units turned out in the same mold and altered by changing foils. In contrast to conventional techniques, no retooling is necessary.

3 **Two reasons** for foiling this urea washing machine switch knob: 1) Sub-surface marking will not wear or scratch off even if washed with detergents by the housewife; 2) Intended for the European market and requiring legends in at least 10 different languages, the knob can use printed foils to cut down on tooling costs required to change markings with other techniques.

4 **Technological advances** have made possible foiling even on the difficult angles of the knob shown at right. Molding in or hot stamping the letters and figures on this knob would have created a production problem.

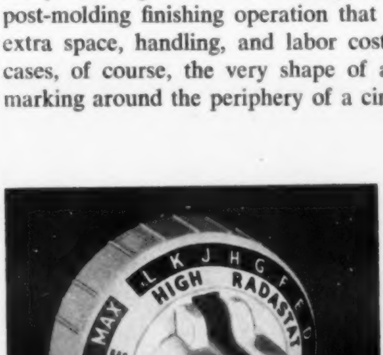
industrial marking: MOLDED-IN FOILS

off during the life of the product is completely eliminated. This latter advantage takes on added importance in light of the volume use of knobs, dials, and nameplates on appliances and equipment that come in for rough handling plus exposure to such elements as detergents, oils, and greases that could wreak havoc on conventional surface markings.

On the question of economics as it applies to urea and melamine components, some obvious—and some hidden—advantages to foiling can be pointed out. Competing with the technique in these areas, of course, are such marking methods as engraving and subsequent coloring by wipe-on, roll-leaf stamping, and spray painting. In contrast to these methods, molded-in foils base their competitive edge on the fact that they are applied directly to the part *during* molding—and not in a post-molding finishing operation that necessitates extra space, handling, and labor costs. In many cases, of course, the very shape of a part, *e.g.*, marking around the periphery of a circular piece, places limitations on conventional surface decoration and opens the door to the use of the foils. And, obviously, as markings become more complex or where multiple color presentations are involved, the economics of foiling show up in a considerably better light.

The design flexibility inherent in the molded-in foil technique can often also be translated into cost savings. Without changing molds or without the expense of extra tooling, for example, manufacturers can alter the legend or change the appearance of a knob, dial, or nameplate simply by substituting a different printed foil into the molding operation.

With these facts as a jumping-off point, worldwide interest has already started to focus on molded-in foils for industrial marking. In England, J. L. Joseph, of Ornamin (U.K.) Ltd., Northampton, manufacturer of foils, reports that some 850,000 industrial moldings marked by the foil technique have been made and 400,000 are in production. Shown here **(To page 171)**



5 **Gas appliance** knob points up the accuracy and close tolerances that can be achieved today with molded-in foils. Because flash line on this part is at the bottom, the foil is inserted in the flat and molded downwards at an angle. If the foil had been a fraction too large, it would have crinkled during molding.

6 **Combination nameplate** and knob is created with separate panel set into recess molded into knob. Both panel and knob face are marked with foils. To conform to design requirements, maximum angle at which ring foils could be molded into knob face without crinkling were arrived at by trial and error. Before adapting foils, manufacturer had to engrave lettering into the knob and then color it with wipe-on technique.

New processes create . . .

Broader markets for powdered PE

Powdered polyethylene (PE) has suddenly become a major focus of interest to many segments of the plastics industry—material suppliers, machinery makers, and processors. It is already generating the kind of excitement that normally precedes a substantial market expansion.

So far, however, sales have been on the modest side, amounting to perhaps 7 million lb. in 1961, counting all uses. But if processor interest and material supplier effort are any criterion, this figure can be expected to double soon. In fact, some estimators forecast 1965 consumption at 20 million pounds.

The physical phenomenon that fascinates those who have worked with the material is the fact that, although the resin comes in the form of a solid powder, it acts very much like a liquid, even in the unmolten state. This means that the solid material can now be used in operations traditionally limited to fluids. Techniques like casting, coating, spraying come immediately to mind.

Initial applications of powdered PE involved such relatively small-volume uses as drums and barrels (Heissler process, Thermofusion), metal coating (fluidized bed), and art (see "Bake a picture with PE", MPl, Sept. 1961, p. 100). But now, two potentially large markets have been breached—rotational molded products and coated backing for moldable carpets. And still other applications loom on the horizon.

Powdered PE in rotational molding

In aiming their guns at the rotational molding market (estimated potential 10 million lb./year by 1965), material suppliers and machinery makers claim better products at lower cost without new capital investment. And in support of their arguments, these industry men set forth the following interesting comparisons:

Raw material cost: Powdered PE for rotational molding sells for 35¢/lb. (27½¢ base price plus 7½¢/lb. grinding charge). Plastisols, for companies who do their own formulating, run between 15¢ to 35¢/lb.; for companies who purchase formulated material, ready for molding, the price ranges from 20¢ to 45¢ per pound. Thus, on an

Three steps in the production cycle of powdered PE

1 **FIRST STEP** in production cycle of hobby horse: Hinged cast aluminum molds are opened and preweighed amount of powdered PE placed in each lower mold half. Frame supporting molds is held in open position during loading and unloading.

2 **VIEW INTO OVEN** during actual molding cycle, showing one supporting arm (unit has five) with molds locked to mold frame. Three molds are mounted in the upper mold frame, while two are accommodated in the lower.

average basis, the initial cost of the two materials is roughly the same.

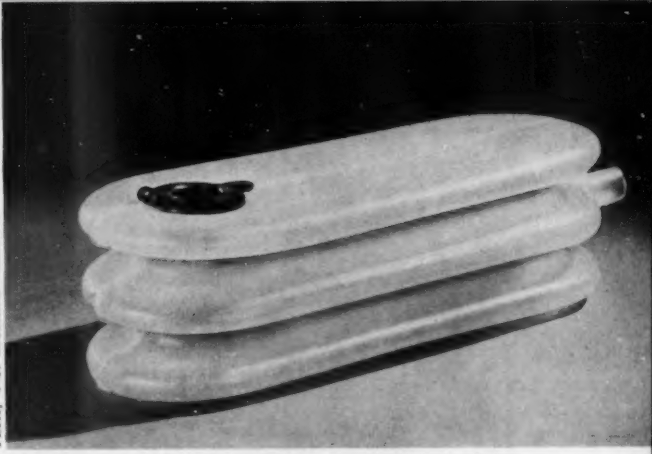
However, for a truer price comparison, specific gravity must be considered. In the case of powdered PE, specific gravity is around 0.915 to 0.920. For vinyl plastisol it is about 1.2 to 1.3. Thus, about 25 to 30% less PE by weight is required for a given volume of molded material.

Here's how this translates in actual production, according to one powdered PE supplier: A manufacturer of a large toy required 4 lb. of a hard plastisol per item. Using powdered PE, he required only 2 lb. 7 oz. of material. If a 30¢ PVC compound of 1.30 s.g. were used, savings realized would come to 20¢ per item, taking into consideration increased labor cost resulting from the need for flame treating the PE piece to assure adequate adhesion for painting and decorating. If a 25¢/lb. plastisol were used, cost would have been about the same. However, it should be pointed out that in this case the molder had been buying formulated vinyl plastisol, but did his own PE compounding.

But specific gravity is not the whole story. Stiffness is still another factor. In some formulations, less powdered PE than plastisol is required to achieve a given stiffness, which increases the weight savings even more. In one instance, a manufacturer of toy balls reported dollar savings of 66% because so much less PE was required to achieve an equivalent performance.

However, there is another side to this coin. Because of this inherently greater stiffness (even in the low densities), PE lacks the soft, rubbery feel required for many applications. While a still thinner wall might approach this property, for truly soft items powdered PE does not seem suitable at the moment. Needless to say, several suppliers are hard at work trying to come up with more flexible PE formulations.

The question of royalties. Rotational molding of vinyl plastisols is covered by U. S. Patent 2,-

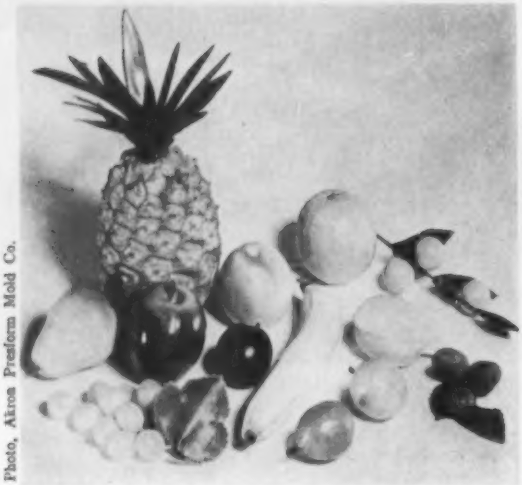


Photo, U.S. Industrial Chemicals

BELLOWS for inflatable mattress, rotationally molded of powdered PE, has uniform wall section that assures its trouble-free operation. Hole to accommodate valve is molded in.

rotationally molded hobby horse

3 **AT END OF CYCLE,** frames are unclamped, molds opened, and horses removed. Following inspection, they then proceed on overhead conveyor lines to finishing stations where they are painted (see right) and packed for shipment.



Photo, Akron Preform Mold Co.

TYPICAL FRUITS now produced from powdered polyethylene by Kendra. Their appearance bears startling resemblance to real fruit (down to the flock blush on the peach).

Photo, Du Pont

MOLDED AUTOMOTIVE carpeting, backed by 12-mil polyethylene coating produced from powdered PE. Application represents biggest single outlet for powdered PE to date.

629,134, which is held by The Sun Rubber Co. The patent, which has been upheld in several courts, covers rotational molding of a liquid mixture of vinyl resin and a plasticizer. Manufacturers of powdered PE state that their materials do not fall under this definition and that, therefore, manufacturers using powdered PE are not subject to royalty fees under the Sun patent.

Equipment. Machines used in rotational molding of plastisols can be used almost without modification for molding powdered PE. Rotational molding machines on the market today run from \$10,000 to \$20,000. Automatic loading devices are also available.

In many cases, molds used for vinyl plastisol molding can also be used to rotationally mold powdered PE items. However, because of the greater stiffness of PE, heavy undercuts or small mold openings will make stripping much more difficult than with vinyl items. In order to overcome this problem, powdered PE will often require split molds. These are made of cast aluminum and cost more than the one-piece electroformed molds now used with plastisols. A typical doll head mold in split cast aluminum comes to \$30; in contrast, a one-piece electro-formed mold used with vinyl would cost about \$18.

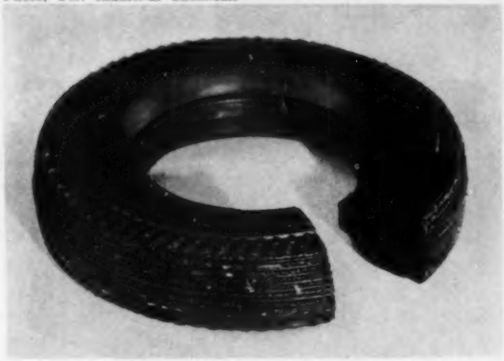
Cycles. Molding cycles for some products may be longer with powdered PE than with plastisols; some increases have been reported as high as 20 percent. It may be necessary to cool the molds for a slightly longer period with powdered PE to give the material sufficient time to set before stripping from the molds. However, in the case of the hobby horse described on p. 93 and shown on pp. 90-91, cycle time was about the same for both powdered PE and the plastisol it replaced.

Property advantages. Resins used in rotational molding of PE powder generally are of densities around 0.915 to 0.920, with a melt index of 22 (for general-purpose applications). Certain higher-density materials (to 0.930) with melt indices as low as 1 have been successfully molded (however, these materials sell at slightly higher prices). The tire shown on p. 93 was produced from such a resin. The wall section is 0.065 in., yet the tire has a high degree of rigidity. High-density resins so far have not been found suitable for this process.

Molding operations. Both producers and processors state that molding powdered PE is less critical than molding of plastisols, which are said to be degraded if the cycle is too long or the heat is too high. They also point to the complete absence of plasticizer migration as an important advantage. Finally, advocates of powdered PE point out that no corrosive fumes are given off during the molding process; and this aspect, according to them, results in reduced plant maintenance cost and raises the possibility of molding metal inserts.

One of the problems currently faced by processors of powdered PE is bridging. This refers to the difficulty in filling of deep, thin cavities. A typical example would be the thin stems on artificial fruit. Some processors have found that, instead of running into the hollow stem, the powder will "bridge" over it, causing a non-filled part. This problem has been tackled by redesigning the product or by blending in very high-melt-index

Photo, U.S. Industrial Chemicals



ROTATIONALLY MOLDED tire for toy wagon is made of 0.930-density powdered PE, has a high degree of rigidity. Note uniformity of wall, thickness of which is 0.065 inch.

Photo, County Plastics

REFUSE CARRYING CANS, produced by modification of conventional rotational casting process. Cans reportedly provide six months' service, compared with two weeks for steel.

resins with the standard material; there's also some thought that finer powder sizes would be the solution.

Rotationally molded hobby horse

One of the most outstanding jobs being run in rotationally molded PE powder today is the hobby horse produced by Tremax Industries Inc., Chicago, Ill. Several models are made, ranging in weight from 1½ to 6 lb. per unit. The company had previously molded horses of plastisol, and also is currently producing blow-molded horses, using high-density PE.

The equipment used for molding these horses is a modified five-spindle commercial rotational molding machine. Basically, the machine consists of an oven through which a set of spindle-mounted molds moves until the powder is melted and evenly distributed along the mold walls; the mold is then cooled, hardening the material, and the molded product removed. In the case of Tremax, the spindles support 10 sets of mold frames which rotate as the spindles move through the oven.

The oven is operated at a temperature of about 570° F. for this particular application. Heat within the oven is zoned by baffling, with the highest temperature at the third position of the mold in the oven. At the fourth station, the molds pass into a shower chamber where 100° F. water is sprayed on them for about 3.75 min., solidifying the molded part. Upon emerging from the shower chamber, the molds are opened, horses removed for subsequent trimming and finishing operations, and molds reloaded.

To provide maximum production, two or more molds are ganged up in each set of frames. In some instances, a single mold frame may be carrying as many as five sets of molds. But regardless of the number of molds, the heating cycle remains constant. In this particular case, about 3.75 min. at each of the five oven positions.

Artificial fruit

Another interesting and significant application of powdered PE is rotationally molded fruit produced by Kendra Inc., Ft. Lauderdale, Fla. This application, too, has been an exclusive plastisol market, although there has been some competition from blow-molded items.

The material used is a 0.915-density resin with a melt index of 6. The job is run on a six-spindle machine. The molds are filled with a predetermined amount of powder and locked in place on the mold base. A total of 24 molds is mounted on each spindle and go through the oven on a 12-min. cycle. Since there are six spindles, five of which are in the oven and the sixth of which is being unloaded and filled, production rate would be 720 pieces per hour. The molds travel through four heating zones, are cooled at station five, and stripped at the sixth. After removal from the mold, the fruits are flame treated prior to the application of paint, coatings, and flocking to give them their realistic appearance. Material cost is about one-half that of liquid vinyl plastisol.

Molded barrels

One of the major advantages claimed for the Engel process (licensed in the U. S. under the Thermofusion designation) and for **(To page 176)**

For postage meter housing . . .

Preform molding slashes tooling costs

The choice of matched die molding of reinforced plastics for the housing of a new postal scale recently enabled Pitney-Bowes Inc., Stamford, Conn., to chalk up savings in tooling costs of 33% as compared to aluminum die casting and a 60% savings compared to deep drawn steel!

Tooling costs for the three processing methods, based on the anticipated yearly requirement of about 2000 scale housings, were estimated to be: for die casting, $15,000 to $20,000; for deep draw stamping, $25,000; and for RP preform molding, $5,000 to $6,000.

Final mold costs for the RP housing were somewhat higher than originally estimated, though still $10,000 to $15,000 below tooling costs for the alternative production methods. A top price was paid for the matched metal dies because they were designed to eliminate several secondary operations. For example, all of the rectangular and circular openings in the housing are produced by inside pinch-offs in the mold. This eliminates cutting and drilling operations and speeds up finishing time. And the molded-in lamp access opening on top of the housing, complete with a flanged rim edge, not only permits firm seating of the metal access cover, but also eliminates the raw edge usually exposed by cutting operations.

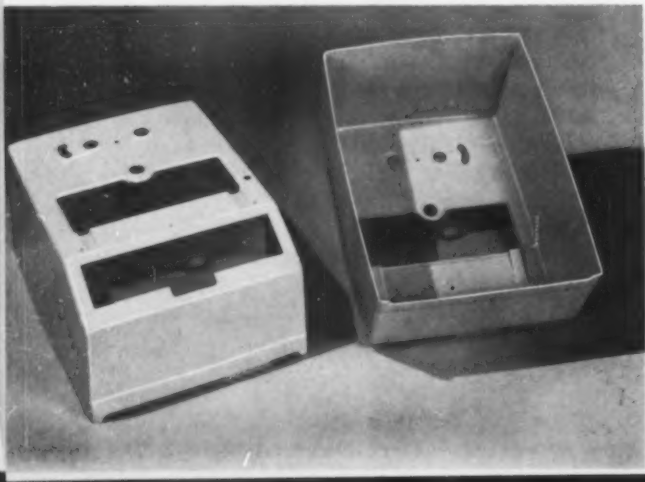
In addition to reducing tooling costs, the use of matched-die-molded reinforced plastics also upgrades the performance of the scale housing. The high-impact strength of molded RP gives the housing better resistance against denting.

The scale housing measures 13 by 17 by 8 in., and has a wall thickness of 0.080 inch. It is molded at 178 p.s.i. and 250° F. on a 2½-min. press cycle. Although no cloth veil is used with the glass-reinforced polyester preform, excellent surface finish is produced by the use of two priming coats, application of a gray alkyd enamel, and a careful 290° F. bake. Finishing consists of the addition of an acrylic dial window in the front of the housing, a die-cast zinc bezel around the front, a punched steel door over the access opening, and the stainless steel scale platform.

The new scale is designed for weighing up to 40 lb. of packaged mail. Pitney-Bowes has previously used RP for the housing of a heavier-duty, 70-lb. scale, and recently introduced a new postage meter case fabricated from three thermoplastic materials (see "A tough case!" MPl, Sept. 1961, p. 93). The postal equipment maker, which has facilities for producing metal components, thus has broadened its experience with plastics materials—successfully and economically!

Credits: Scale housing molded by Molded Fiber Glass Co., Ashtabula, Ohio. Design of housing by Lippincott & Margulies Inc., New York, N. Y.—**End**

ONE-PIECE SCALE HOUSINGS are molded from glass-reinforced polyester preforms. Matched metal dies incorporate inside pinch-offs to form all openings, thereby eliminating costly finishing operations.



New directions in urethane foams

Part II: The flexibles

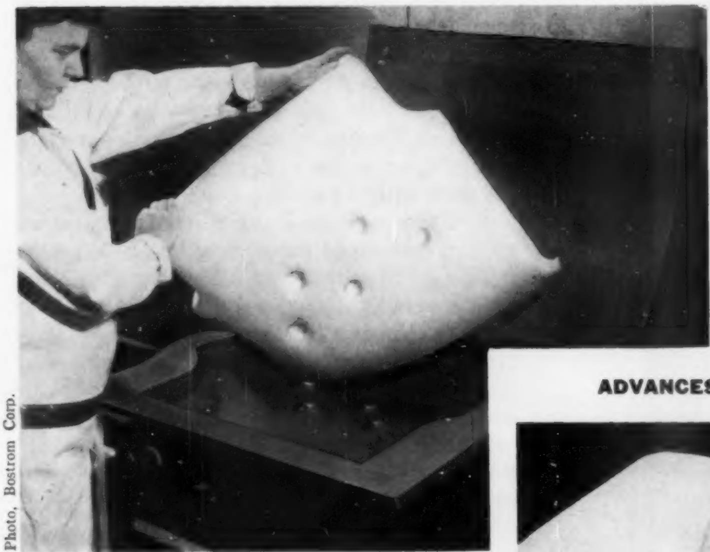
For end-users interested in the flexible, open-cell foams, perhaps the best approach to evaluating their possibilities would be through a study of existing markets where the foams have already proved out—and where development work is now going on. Basically, there are five markets which account for the bulk of material used.

1. Furniture cushioning is the big one. By the end of this year, about 50 million lb. will be used for sofas, chairs, and couches of all types. By 1965, the figure should top the 80-million-lb. mark. Look for a change in styling to beef the market up even more as designers swing away from the simple-shape cushions of Danish Modern to the more three-dimensional curvatures for which urethanes are so eminently suited. And if some of the new molding techniques now in the works start rolling soon, traditional furniture manufacturing concepts may be in for a full-scale shake-up.

2. Bedding accounted for some 8 to 10 million lb. of urethane this year. By 1965, it may hit an annual volume of 60 to 70 million pounds. Cost savings that can be effected through use of urethane foams indicate that the urethanes will be going after the $35 to $50 price range of mattresses (which accounts for 78% of total mattress sales) where their performance shows up superior to constructions now on the market. Within five years, urethanes may pick up at least a 30% slice of this pie—with prospects for increasing in use even more significantly after that.

3. Automotive and truck seating may be absorbing over 20 million lb. of material by the time

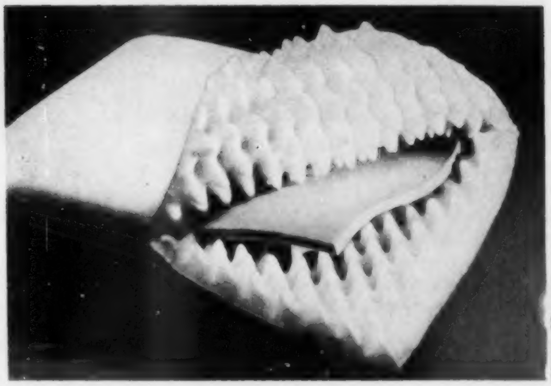
IMPROVED MOLDING TECHNIQUES



Photo, Bostrom Corp.

PRODUCTION SAVINGS of more than one-third over conventional upholstery methods result from using molded flexible urethane sections on a new contour-chair lounge. Making savings possible are such innovations as molded-in impressions for buttons in head section for lounge (shown being lifted out of the mold).

ADVANCES IN 3-D DIE CUTTING



Photo, Nopco

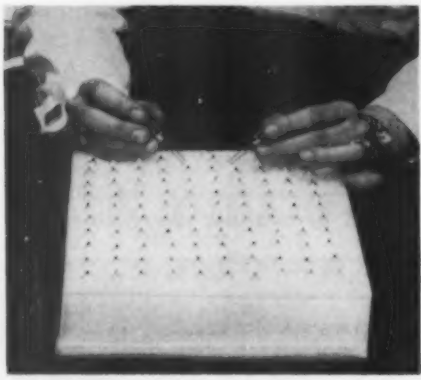
INTRICATELY CORED flexible slab stock which is used in a sleeping pillow to provide high degree of cushioning comfort is typical of the type of work that can be done today with fast, economical techniques of die cutting.

FOAM LAMINATES ARE BIG

Photo, Scott Paper Co.

TOPCOATS for men and women have developed into volume markets for flexible urethane foam linings—15 to 20 million lb. by next year. Foam's high insulating qualities and light weight contribute to garment's wearing comfort; excellent hand and drape and outstanding crease and wrinkle resistance are other benefits.

PACKAGING HAS POTENTIAL



Photo, National Aniline Div., Allied Chemical Corp.

PRODUCTS RANGING from delicate electronic parts, such as these mercury switches, to guided missiles can be shipped safely in urethane foam packages. The packages are reusable, can be tailored to fit the requirements of any packaging application, and offer outstanding cushioning, vibration dampening, shock absorption, and thermal and acoustical properties.

1963 rolls around and some 40 million lb. by the end of 1965. In passenger car seating, at least 90% of the foam now being used—mostly in the form of topper pads that go over springs—is already urethane. And keep your eye on two significant developments: increased styling emphasis on form-fitting bucket seats that use substantial quantities of both slab and molded foam; and the recent announcement by a leading auto maker that 1963 models would use improved foams at densities of only 1.6 lb./cu. ft.—27% less than the densities used four years ago. Add another 20 to 25 million lb. for the amount that auto makers may also be using by 1965 for instrument panel padding, sun visors, armrests, door linings, fabric-foam upholstery, roof lining, and similar applications. If legislation on safety in autos passes, the figure could be even higher.

4. Foam linings, $\frac{1}{16}$ to ⅛ in. thick, have taken off this year in the garment field with an alacrity that has surprised everyone. To date, conservative estimates set this market for next year at a 15- to 20-million-lb. level. Originally intended to stabilize the knitted fabrics that go into men's car coats, the concept of foam backing has already spread into men's topcoating, boys' wear, women's and girls' coats, hats, and caps. Handbags and luggage applications have also found use for the material as a backing. And add to the list: hunter's jump suits, cold-weather gear, lightweight sleeping bags, and underwear. Although the sudden jump in volume (from virtually nothing in 1959) has caused some to feel that the lure of quick profits would result in mis-use, over-production, and price-cutting, recent months have seen signs of a tightening up in quality as responsible textile people are starting to move into the area.

5. Carpet underlay is one of those undeveloped markets that could conceivably hit a 10- to 15-million-lb. capacity by 1965. Key to growth is the development of equipment that could apply the foam as an integral backing directly onto the carpet during manufacturing operations—at finished costs that could make the foam competitive with low-cost hair and felt products.

It is through development of these five markets that the flexible urethane foams hope to reach an annual market of 250 million lb. by 1965—and 350 million lb. by 1970. But, while these routes have already been well travelled, there are other new avenues left to explore.

Properties are unique

Most of the applications noted above emphasize the unique compression/deflection characteristics of the urethanes that contribute to the intangible

Who's who in urethane foams

Manufacturers of Isocyanates

Allied Chemical Corp.
National Aniline Div.
New York, N. Y.

Carwin Co.[1]
North Haven, Conn.

E. I. du Pont de Nemours & Co. Inc.
Wilmington, Del.

Food Machinery and Chemical Corp.[2]
New York, N. Y.

Mobay Chemical Co.
Pittsburgh, Pa.

Nopco Chemical Co.[3]
N. Arlington, N. J.

Suppliers of Polyols for Foams
(A) Polyether (B) Polyester

Allied Chemical Corp.
National Aniline Div. (A)
Plastics Div. (B)
New York, N. Y.

Atlas Mineral Products Div.
Electric Storage Battery Co.
Mertztown, Pa. (B)

Atlas Chemical Industries Inc.
Wilmington, Del. (A)

Baker Castor Oil Co.
Bayonne, N. J. (A,B)

Corn Products Sales Co.
New York, N. Y. (A)

Dow Chemical Co.
Midland, Mich. (A)

Emery Industries Inc.
Cincinnati, Ohio (B)

Freeman Chemical Corp.
A Subs. of H. H. Robertson Co.
Port Washington, Wis. (B)

Glidden Co.
Cleveland, Ohio (B)

Hooker Chemical Corp.
Durez Plastics Div.
N. Tonawanda, N. Y. (B)

Jefferson Chemical Co.
Houston, Texas (A)

Mobay Chemical Co.
Pittsburgh, Pa. (B)

Mol Rez Div.
American Petrochemical Co.
Minneapolis, Minn. (A,B)

Nopco Chemical Co.
N. Arlington, N. J. (B)

Olin Mathieson Chemical Corp.
Baltimore, Md. (A)

Pittsburgh Plate Glass Co.
Pittsburgh, Pa. (A,B)

Union Carbide Chemicals Co.
New York, N. Y. (A)

Witco Chemical Co. Inc.
New York, N. Y. (A,B)

Wyandotte Chemicals
Michigan Alkali Div.
Wyandotte, Mich. (A,B)

Manufacturers of Catalysts for Foams

Houdry Process Corp.
Philadelphia, Pa.

Jefferson Chemical Co.
Houston, Texas

Metal & Thermit Corp.
Rahway, N. J.

Mobay Chemical Co.
Pittsburgh, Pa.

Nuodex Products Co.
Div. of Heyden Newport Chemical Corp.
Elizabeth, N. J.

Union Carbide Chemicals Co.
New York, N. Y.

Witco Chemical Co. Inc.
New York, N. Y.

Mfrs. of Fluorocarbon Blowing Agents

Allied Chemical Corp. (Genetron)
General Chemical Div.
New York, N. Y.

E. I. du Pont de Nemours & Co. Inc. (Freon)
Wilmington, Del.

Pennsalt Chemicals Corp. (Isotron)
Philadelphia, Pa.

Union Carbide Chemicals Co. (Ucon)
New York, N. Y.

Suppliers of Foaming Systems

American Latex Prods. Corp.
Hawthorne, Calif.

Archer-Daniels-Midland Co.
Plastics Div.
Minneapolis, Minn.

Armstrong Cork Co.
Insulation Div.
Lancaster, Pa.

Atlas Mineral Products Div.
Electric Storage Battery Co.
Mertztown, Pa.

Axel Plastics Research Labs.
Long Island City, N. Y.

B. B. Chemical Co.
Cambridge, Mass.

Baker Castor Oil Co.
Bayonne, N. J.

C. P. R. International
Torrance, Calif.

Carwin Co.
North Haven, Conn.

Chase Chemical Corp.
Pittsburgh, Pa.

Chemical Coatings & Engineering Co.
Media, Pa.

Commercial Resins Corp.
St. Paul, Minn.

Cook Paint & Varnish Co.
N. Kansas City, Mo.

Dayco Corp.
Dayton, Ohio

Dow Chemical Co.
Midland, Mich.

Electro-Chemical Eng. & Mfg. Co.
Emmaus, Pa.

Flexible Products Co.
Marietta, Ga.

Freeman Chemical Corp.
A Subs. of H. H. Robertson Co.
Port Washington, Wis.

Furane Plastics Inc.
Los Angeles, Calif.

General Latex and Chemical Corp.
Cambridge, Mass..

General Plastics Mfg. Co.
Tacoma, Wash.

General Tire & Rubber Co.
Chemical Div.
Akron, Ohio

Glidden Co.
Cleveland, Ohio

Hastings Plastics Inc.
Santa Monica, Calif.

Hexcel Products Inc.
Applied Plastics Div.
El Segundo, Calif.

Hooker Chemical Corp.
Durez Plastics Div.
N. Tonawanda, N. Y.

Isocyanate Products Inc.
New Castle, Del.

Jered Products Inc.
Birmingham, Mich.

Kristal Kraft Inc.
Palmetto, Fla.

Marblette Corp.
Long Island City, N. Y.

Marvel Plastics Co.
A Div. of Industrial Research & Engineering Associates
Buena Park, Calif.

Mol Rez Div.
American Petrochemical Co.
Minneapolis, Minn.

Naugatuck Chemical Div.
United States Rubber Co.
Naugatuck, Conn.

Nopco Chemical Co.
N. Arlington, N. J.

Pelron Corp.
Lyons, Ill.

Phillips-Foscue Corp.
High Point, N. C.

Pittsburgh Plate Glass Co.
Pittsburgh, Pa.

Poly Resins
Sun Valley, Calif.

Polytron Corp.
Richmond, Calif.

Reichhold Chemicals Inc.
White Plains, N. Y.

Spartan Products Inc.
Madison Heights, Mich.

Stauffer-Hewitt Inc.
Franklin, N. J.

Thiokol Chemical Corp.
Trenton, N. J.

John H. Witte & Sons
Burlington, Iowa

Mfrs. of Slab and Molded Products
(A) Flexible slab (B) Rigid slab

Aircraft Specialties Co. Inc.
Hicksville, N. Y. (B)

Allied Chemical Corp.
Barrett Div.
New York, N. Y. (B)

(Continued on next page)

[1] Specialty isocyanates
[2] Production by 1963.
[3] Production by 1962.

American Latex Products Corp.
Hawthorne, Calif. (A,B)

American Rubber & Plastics Corp.
La Porte, Ind. (A)

Arlee Foam Rubber Products Inc.
Gardena, Calif. (A)

Armour & Alliance Industries
Los Angeles, Calif. (A)

Armstrong Rubber Co.
West Haven, Conn. (A)

F. Burkart Mfg. Co.
St. Louis, Mo. (A)

Wm. T. Burnett & Co.
Baltimore, Md. (A)

Burton-Dixie Corp.
Chicago, Ill. (A)

C. P. R. International
Torrance, Calif. (B)

Carolina Industrial Plastics Div.
Essex Wire Corp.
Mt. Airy, N. C. (A)

E. R. Carpenter Co.
Richmond, Va (A)

Dayco Corp.
Dayton, Ohio (A)

Dow Chemical Co.
Midland, Mich. (B)

Firestone Synthetic Rubber & Latex Co.
Div. of Firestone Tire & Rubber Co.
Akron, Ohio (A)

Foam Products Inc.
Manchester, Pa. (A)

Future Foam Inc.
Omaha, Neb. (A)

General Foam Corp.
New York, N. Y. (A)

General Plastics Mfg. Co.
Tacoma, Wash. (B)

General Tire & Rubber Co.
Industrial Products Div.
Marion, Ind. (A)

B. F. Goodrich Sponge Products Div.
Shelton, Conn. (A)

Goodyear Tire & Rubber Co.
Akron, Ohio (A)

Hastings Plastics Inc.
Santa Monica, Calif. (B)

Hexcel Products Inc.
Applied Plastics Div.
El Segundo, Calif. (B)

Hudson Cush-N-Foam Corp.
Edgewater, N. J. (A)

Insulfoam Inc.
Keyport, N. J. (B)

International Foam Corp.
Chicago, Ill. (A)

Jersey City Foam Products Co.
Jersey City, N. J. (A)

Midwest Foam Products Co.
North Chicago, Ill. (A)

Mol Rez Div.
American Petrochemical Co.
Minneapolis, Minn. (B)

National Gypsum Co.
Buffalo, N. Y. (B)

Newport Plastics Corp.
Newport, Vt. (B)

Nopco Chemical Co.
N. Arlington, N. J. (A)

Olympic Chemical Co.
Greensboro, N. C. (A)

Paramount Foam Industries
Lodi, N. J. (A)

Pelron Corp.
Lyons, Ill. (A,B)

Phillips-Foscue Corp.
High Point, N. C. (A)

Pittsburgh Corning Corp.
Pittsburgh, Pa. (B)

Plastomer Corp.
Detroit, Mich. (A)

PolyStructures Inc.
Stoneham, Mass. (B)

Reeves Bros. Inc.
Curon Div.
New York, N. Y. (A)

Scott Paper Co.
Foam Div.
Eddystone, Pa. (A)

Sheller Mfg. Co.
Dryden Rubber Div.
Keokuk, Iowa (A)

Sparton Products Inc.
Madison Heights, Mich. (B)

Stauffer-Hewitt Inc.
Franklin, N. J. (A)

Toyad Corp.
Latrobe, Pa. (A,B)

Ultra Plastics Inc.
Philadelphia, Pa. (B)

Union Asbestos & Rubber Co.
Bloomington, Ill. (B)

Urefoam Corp.
Camden, N. J. (B)

Urethane Corp. of America
Medina, N. Y. (A)

Urethane Corp. of Calif.
Compton, Calif. (A,B)

U. S. Foam & Chemical Inc.
Philadelphia, Pa. (B)

U. S. Rubber Co.
Chicago, Ill. (A)

Werner, H. E., Inc.
Bethel Park, Pa. (B)

Werner, H., & Sons
New Bedford, Mass. (A)

Because of the unique versatility of urethane chemistry, most of the companies listed above can, and in many instances already have, adapted their production line to the molding of end-products. Other companies which report themselves as specializing in molding foams, either on a custom or proprietary basis, include:

Acme Laminating and Plastics Co. Inc.
Detroit, Mich.

American Seating Co.
Grand Rapids, Mich.

Bostrom Corp.
Milwaukee, Wis.

Davidson Rubber Co.
Dover, N. H.

Foamed Plastics Corp.
Spokane, Wash.

General Motors Corp.
Inland Mfg. Div.
Dayton, Ohio

Jered Products Inc.
Birmingham, Mich.

Reynolds Chemical Products Co.
Whitmore Lake, Mich.

Standard Plastics Inc.
Fogelsville, Pa.

Thermal Products Co.
Houston, Tex.

Manufacturers of Equipment for Foaming Urethane

(A) Metering and mixing (B) Spray-up (C) Frothing

Admiral Equipment Corp.
Akron, Ohio (A,B,C)

Automatic Process Control Inc.
Union, N. J. (A)

Binks Mfg. Co.
Chicago, Ill. (A,B)

Chase Chemical Corp.
Pittsburgh, Pa. (A,B)

DeVilbiss Co.
Toledo, Ohio (A,B)

Electro-Chemical Eng. & Mfg. Co.
Emmaus, Pa. (B)

Flexible Products Co.
Marietta, Ga. (A,B)

The Gray Co.
Minneapolis, Minn. (A,B)

A. Gusmer Inc.
Woodbridge, N. J. (B)

Hardman, H. V., Co. Inc.
Belleville, N. J. (A)

Hull Corp.
Hatboro, Pa. (A)

Isocyanate Products Inc.
New Castle, Del. (A,B,C)

Jennings Engr. Co.
Philadelphia, Pa. (A,C)

Jered Products Inc.
Birmingham, Mich. (A,B)

Lake Erie Machine Co.
Toledo, Ohio (A,B)

Leal Corp., The
Oaklyn, N. J. (A)

Marvel Plastics Co.
Buena Park, Calif. (A,B,C)

Mechanical Handling Systems Inc.
Detroit, Mich. (A)

Mitchell Specialty Div.
Novo Industrial Corp.
Philadelphia, Pa. (A,B,C)

Peterson Products
Belmont, Calif. (A,B,C)

Plastic Engr. & Chemical Co.
Ft. Lauderdale, Fla. (A,B)

Pollard, Stephen, Co.
Monrovia, Calif. (A,B)

PolyStructures Inc.
Stoneham, Mass. (A)

Polytron Corp.
Richmond, Calif. (A,B,C)

Prodco Inc.
Cicero, Ill. (A)

Pyles Industries Inc.
Detroit, Mich. (A,B,C)

Raven Industries Inc.
Sioux Falls, S. D. (A,B,C)

Rogers Assocs. Inc.
W. Caldwell, N. J. (A)

Spray-Bilt Inc.
Hialeah, Fla. (A,B,C)

Sterling Alderfer Co.
Akron, Ohio (A)

Stuart Marine Service
Stuart, Fla. (A,B)

Sweets, Martin, Co. Inc.
Louisville, Ky. (A,B)

Williams, Gabriel, Co. Inc.
Freeport, N. Y. (A,B,C)

Note: Many equipment manufacturers can also supply foaming systems.

known as "comfort cushioning." To get the most mileage out of these properties, the Cellular Plastics Div. of the Society of the Plastics Industry Inc. has already prepared for the industry a "Buyers Specification Guide for Comfort Applications." Other plusses that have snared for the foams the seating and bedding markets include: light weight, good chemical resistance and aging properties, shock absorbency, outstanding insulating qualities, and the fact that the material is non-allergenic, non-toxic, and will not absorb moisture or body odors.

Add to these properties urethane's relatively low cost. As a comparison, here is how it stacks up against one of its biggest competitors—latex rubber foam. A commercial urethane foam with a density of about 1.4 to 2.2 lb./cu. ft. has a 25% compression at an applied load of between 18 to 30 lb./50 sq. inch. To get comparable properties in latex rubber foam, a density of about 6 lb./cu. ft. for uncored stock or about 4 lb./cu. ft. for cored stock is required. Net result: urethane foam is about 40% cheaper than latex foam and about 33 to 50% as heavy. Current prices fix flexible urethane slab stock in the range of 10 to 15¢/board ft.; comparable latex foam slab would sell for 22 to 25¢/board foot.

Basic costs, however, are not the whole story with flexible urethane foams. How, for example, can you put a price tag on the fact that urethane foams can be formulated to meet the need for hardness or softness, firmness or resiliency, stiffness or flexibility? Furniture designers can have their whims—whether it be for providing support in thin sections (as in wafer-thin high back seating pieces) or for eliminating conventional coil spring platforms—and there'll be a urethane available to meet the need.

But it is in bringing these whims within the economical dictates of mass production processes that the urethanes really begin to shine. And end-users in all industries could profit much by watching their progress in this area.

Versatility in processing

Unlike the rigids discussed last month, slab stock is still the backbone of the flexible foam industry. In the simple shapes which characterize much of today's furniture and such cushioning applications as topper pads, the ease with which slab can be cut to size is an important asset to any production line. Where more complex curvatures are involved, the industry has risen to the occasion with a number of unique three-dimensional die cutting processes that can also be performed quickly and economically. Air-O-Plastik Corp.,

FILTERS REPRESENT NEW CONCEPT


Photo, Scott Paper Co.

SPECIAL OPEN-CELL foam which can be rewashed and reused without oiling or other treatment is used in this seven-pleat industrial filter. Foam is resistant to water, moisture, and cleaning agents. Anticipated life expectancy of foam component: 15 years.

INDUSTRIAL USES ARE CATCHING ON


Photo, Reeves Bros. Inc.

WORKMEN PREPARE surface of chemical storage tank with mastic cement before applying sheets of vinyl backed with a flexible urethane foam insulation. Joints are sealed with an adhesive polyethylene tape. Technique cut installation costs by approximately 30% as compared with linings of other materials.

Union City, N.J., for example, uses dies made from wood and metal to compress the foam. Part of the distended slab is then cut off by a saw; when the die is removed, the foam takes the desired shape of the product.

But it is toward the molding possibilities for urethane foams that most eyes are being turned today. Molding of flexible prepolymer systems (in which isocyanate and polyol are pre-reacted) has already been developed to a fine art. Companies such as Inland Mfg. Div. of General Motors report that a prepolymer system has already been adapted to a production line for turning out automotive topper pads on a continuous basis. Inland's current plant can produce as much as 1200 lb. per hour.

Next step for the industry: one-shot closed molding in which the ingredients are stored separately and reacted together at the time of manufacture. The appeal of one-shot molding lies in the fact that load-bearing characteristics are improved, production techniques can be simplified, and one-shot systems are more stable in the pregel stage, are capable of greater lateral flow and vertical rise, and offer improved consistency of texture throughout the molded piece.

Because of the high labor costs involved in the hand operations that now go into furniture assembly and upholstering, the economic advantages of a molded product are apparent—especially in instances where volume is large and dimensions are standard, *e.g.*, in automotive or auditorium seating. The approaches being taken in adapting the idea of molding are also of interest in emphasizing the design flexibility inherent in urethane foams. In the automotive industry, one approach has been to full-depth foam seats molded directly over zig-zag springs. In commercial chairs, some manufacturers have taken the same approach; others have gone to an all-foam concept: a tubular steel frame positioned in a mold cavity and the urethane foamed around it. Combining cushioning and upholstery together in a single manufacturing step is also possible by laying a vinyl or rubber skin into a mold and foaming directly into the skin. The foam adheres permanently to the skin, thereby eliminating the sawing and tacking operations that are used with conventional methods. And in this way, there are no seams to tear or absorb moisture.

At the present time, however, the biggest advances made in molding will probably be along more conventional lines—the use of contoured molded pieces easily applied to a one-piece frame to achieve a sculptured finished appearance. And don't overlook the possibilities for the economical use of slab stock in this area to give the end-product the one or two small touches that spell out "custom built."

INSTALLATION IS ECONOMICAL

Photo, National Aniline Div., Allied Chemical Corp.

SELF-ADHESIVE urethane foam is finding use as weather stripping or for other sealing, cushioning, or insulating applications. The foam stripping is applied by pulling off the paper backing, then pressing the adhesive side firmly against the surface to be covered.

Foam as a backing

In using foam as a garment lining, properties other than those that have made it such an outstanding cushioning material comes into play—and again a number of unique manufacturing operations have been developed that conceivably can have ramifications in industries other than the textile industry.

As a garment lining, flexible urethane foam offers a very high insulting quality, yet it breathes freely and is light in weight. This means that a man's topcoat incorporating a shell fabric of about a sportcoating weight when laminated to foam is lighter than a topcoat made of conventional 16-oz. topcoating material. Such a garment would not be uncomfortable at temperatures up around 60° F., yet is comfortably warm around 10° F. Other plusses for such laminates include: excellent hand and drape and outstanding crease and wrinkle resistance.

Most important, garments made with the material sell within the textile industry's current pricing structure. In addition—and **(To page 186)**

Precision-molded urea sphere

is the key element in what is certainly one of the most radical departures in typewriter design since the instrument first appeared on the market. The new typewriter, an electric model known as the Selectric and marketed by International Business Machines Corp., New York, N. Y., has none of the conventional metal type bars nor does it have the familiar movable carriage.

Instead, there is only the single nickel-plated urea element—with all the raised letters, numerals, and punctuation symbols molded into the surface of the part. Since the part itself is no larger than a golf ball, this necessitated both precision mold design and molding to extremely close tolerances. As the accompanying photos illustrate, IBM's success with the job marks the part as a significant achievement in plastics engineering.

In operation, the urea sphere moves across the paper on its carrier, tilting and rotating at high speeds as it selects and types the desired character or symbol. The left-to-right motion of the sphere eliminates the need for a conventional movable carriage. According to IBM, the concept also eliminates key clashes or printing above or below the line; when two keys are struck almost simultaneously, the first character has to be typed out before the second moves into position. And there's an added bonus: the typist can change type styles in seconds by simply unhooking the urea part and replacing it with another element that has the desired type face molded in (extra heads cost $15).

The choice of urea for the job was dictated by the material's impact strength, its resistance to acids, its dimensional stability, and its adaptability to mass-production precision molding. And judging by the way in which the sphere is called on to spin and stop short with split-second timing, light weight was probably also a factor. Urea is supplied by Allied Chemical Corp.

It's a new departure in plastics usage and one that should rank high among the year's important application breakthroughs.—**End**

UREA SPHERE, shown in position in new typewriter below, whirls and tilts during typing. Paper remains stationary while sphere, ribbon, and mechanical housing move across it from left to right.

ALL-PLASTICS DEODORANT MACHINE

Unit cost reduced by 20%, weight cut in half—

OLD

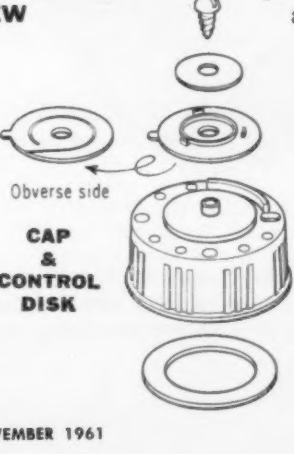
NEW

That's the scorecard on the all-plastics toilet deodorant dispenser recently introduced by West Chemical Products Inc., Long Island City, N. Y. The new units, which are gradually replacing devices fabricated from galvanized steel stampings, are made up of six plastic components: a deodorant container blow molded of high-density polyethylene; a breather tube extruded of conventional PE; and a two-piece housing, a container support, and a fluid control disk, all injection molded of styrene-acrylonitrile copolymer. ■ The new unit weighs slightly under 20 oz., about 50% less than its metal predecessor; and the reduction in production cost per unit is estimated at 20 percent. Added to these advantages are the savings in handling and transportation costs. ■ However, the greatest benefit has been in improved performance. A variety of metal materials preceded plastics in the production of the deodorant machines. All of the machines had one problem in common: the essential oils and perfumes used in the deodorants progressively attacked and pitted the plated and lacquered finishes; and moisture vapor rusted the inside of metal fluid containers. ■ But with the selection of plastics both problems are completely eliminated. ■ In the galvanized steel machine, the container holding the deodorant had to be stamped, shaped, and soldered together, and a hole had to be drilled through the bottom to allow insertion of a metal breather tube. With the redesigned bottle, the container is blow molded in one piece, including an integrally molded narrow groove for the PE breather tube along one side of the container. After molding, a hole is punched through the wall at the top of this groove, the top of the breather tube is then pushed through the hole into the container, and the rest of the tube is laid in the groove and adhered with an epoxy (see cross-section, left). Purpose of the breather tube is to equalize the static head pressure in the container and bring about an even flow of deodorant. The containers are blow molded in 4-cavity molds on a double-station manifold machine equipped with an accumulator.

and product performance greatly upgraded!

OLD

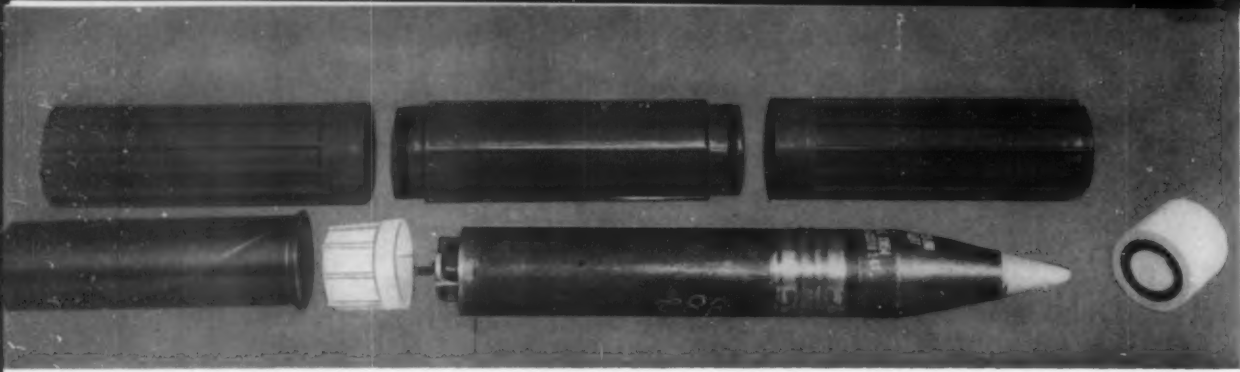
NEW



CAP & CONTROL DISK

■ Use of plastics has also paid off in improved function of the housing. Much of the effective operation of these machines, in addition to placing a measured amount of deodorant into urinals and toilet bowls, lies in treating the surrounding air with deodorant fumes. This is accomplished by means of a cotton fabric wick located in the base of the machine, which becomes saturated with a portion of the deodorant and releases the odors through vents in the machine housing. In the galvanized steel machines, vented areas for release of the odors were narrow and concentrated in the bottom of the housing. The all-plastics machine features a molded-in grillework vent panel which occupies much of the front of the housing, and also has sizable vent openings along the rear. The two housing components, as well as the container support, are injection molded in a 3-cavity combination mold on 16- to 20-oz. machines. ■ The plastic container cap, with a fluid control disk attached to its top, is not a new component, having been used with the containers in the steel deodorant machines. Nevertheless, the design and operation of the cap is unique. Molded into the underside of the fluid control disk is a shallow spiral groove, the depth and length of which controls the amount of deodorant dispensed (normally it is roughly 30 cc. per day). If it is necessary to increase the amount of deodorant flow, the disk can be rotated to shorten the length of groove which must be travelled by the deodorant. ■ The container support, which is solvent-cemented into the housing, also serves as a table upon which the deodorant fluid is released. The fluid overflows and runs underneath the container support, then is dispensed through the aluminum tube into the toilet facility. ■ Well over one-half million of the galvanized steel deodorant machines have been marketed since their introduction. These machines are now being gradually replaced by the all-plastics models. It is estimated that these replacements, plus new sales, add up today to a market of approximately 100,000 units per year.

Credits: Design of components by Gerald C. Johnson Assocs., Bronxville, N. Y., and Highland Labs, Holliston, Mass. Container blow molded by Air-Formed Products Corp., a subsidiary of Bemis Bro. Bag Co., Nashua, N. H. Housing and container support molded by C. B. Cotton & Co. Inc., Brooklyn, N. Y. Breather tube extruded by Hydrawlik Co., Roselle, N. J. Styrene-acrylonitrile copolymer resin supplied by Union Carbide Plastics Co., New York, and high-density polyethylene by Celanese Plastics Co., Newark, N. J. Epoxy-based adhesive compound supplied by H. V. Hardman Co. Inc., Belleville, N. J., and General Mills Inc., Kankakee, Ill.—**End**



HIGH-DENSITY PE is used for container for boosted rocket round. Container, 5¾ in. in diameter and 52 in. long when assembled, will soon be in production. Two high-density PE moldings are used to support ammunition within container.

Military's use of plastics for ammunition containers has important commercial implications. Involved are entirely new concepts in:

Faced with the problem of designing ammunition containers to withstand the type of rugged conditions that would tax the ingenuity of most commercial packers and shippers, the military has recently put into use a number of unique packages based on plastics materials—with high-density polyethylene, reinforced plastics, and foamed plastics in the forefront. In departing from the traditional metal-and-wood approach, the emphasis has been laid on plastics' ability to deliver needed strength and long-term protection at lower costs. And design areas feeling this shift to plastics already include exterior containers, interior supports, cushioning, and such miscellaneous parts as grommet rings and storage bags.

Such product developments initiated by the Armed Forces, while, of course, concerned with military applications; nevertheless, hold many lessons that can be applied, directly or indirectly, to consumer or industrial products.

For another, the military represents a tremendous potential market, the surface of which has been barely scratched by the plastics industry. One relatively small application alone (described immediately below), for example, could consume several million pounds of polyethylene (PE). And that's just one of several applications which is expected to come to the fore.

Some of these applications have been reported earlier.[1] Now, however, we have reached the stage where isolated applications are merging into a definite trend that may eventually develop into an ever-broadening two-way street of plastics idea exchange between American industry and the military services.

Ammunition container

An interesting case in point is a molded high-density PE pack for a boosted rocket round of ammunition. The pack consists of three injection-molded cylindrical sections, with threaded joint gasketed closures. The container offers many advantages over the conventional containers originally used for this item.

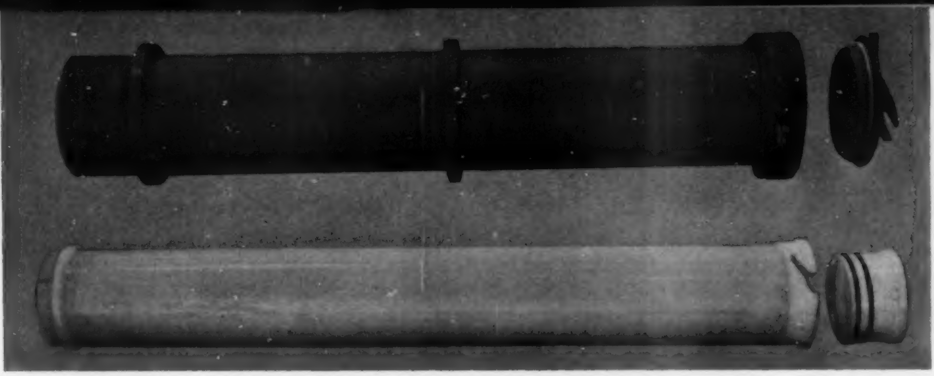
First, the PE acts as a combined interior-exterior container, while in the usual pack, two asphalt-impregnated fiber containers, which serve to protect the ammunition against chemical deterioration, must be shielded from physical damage by a wirebound wood box overpack. This feature results in economies in packaging the ammunition at the manufacturing plant, simplifies inspection and maintenance of ammunition, and permits ready access at the launching point.

Second, the PE container affords substantial savings in package weight, storage space, and cost, as summarized in the following table:

	New container	*Old container*	*Savings*
Weight, lb.	7	22	15
Volume, cu. ft.	1.01	1.85	0.84
Cost, $	6.75	6.82	0.07

In addition, the PE container is not susceptible to fungus, termite, or bacterial attack, withstands the temperature extreme of military shipment and

*Ordnance Corps, Picatinny Arsenal, Dover, N. J.
[1]See "ABS shells save $14 per firing," MPl, Feb. 1960, p. 90; "ABS joins the artillery," MPl, Feb. 1958, p. 96; and "Polyethylene cartridges," MPl, Dec. 1958, p. 95.



CONTAINER of high-density PE (foreground) will be used for propellant charges (cylindrical bags of powder). Also shown is painted steel container currently used for this purpose.

HEAVY-DUTY PACKAGING

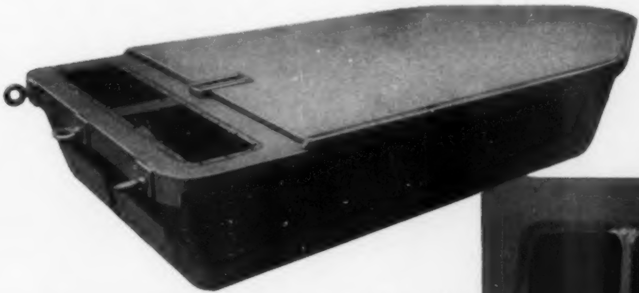
By James Spilman* and Howard Weiner*

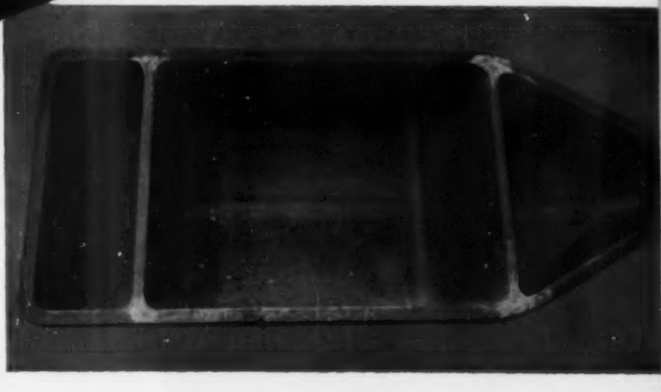
storage, and provides the necessary degree of water- and water-vapor proofness.

The cases are molded of 0.960-density resin, with a melt index of 2, by Molded Insulation Co., Philadelphia, Pa., on a 48-oz. horizontal injection machine in single-cavity molds. Wall thickness is 3/16 in. on an average. The package is produced in three sections (two end sections being identical), plus two molded supports (the latter are produced on a 12/16-oz. machine of the same material). The two end sections measure 18 in. long each, the center section, 19 in.; all three sections have an outside diameter of 5¾ inches. Each section weighs somewhat over 2 pounds. When fully assembled, the overall length of the package is 52 inches. Similar economies and advantages were obtained with another high-density PE container for shipment of propellant charges for large-caliber artillery ammunition. Currently, these charges, consisting of several cloth bags containing the propellant, are packed in painted steel containers. The new PE unit will also eliminate the need for renovation and maintenance. And it will conserve metal and other strategically important materials in case of emergencies. The case is now under development, and initial test results indicate ultimate acceptance as a standard item.

Demolition device

A different kind of approach is represented by the Projected Charge Demolition Kit, which is intended as a device for clearing a (To page 200)





MINE-CLEARING KIT is still under development. Hull-shaped unit of RP will be dragged across mine fields to clear path for tanks, will also act as shipping container for "classified" interior equipment. Hull is 12 ft. long and weighs approximately 900 pounds.

Mold design for expandable polystyrene — Part I

By Frank Lambert†

Although expandable polystyrene (PS) is at least seven years old, it has only been within the past few years that rapid strides have been made in the development of mold designs and molding techniques. This section—the first part of a two-part definitive article—deals with the geometrical and structural design of the cavity and core and associated mold features. Part II of the article, to appear in a subsequent issue, will deal with the selection of materials for mold construction and mold fabricating methods.

Since the design of the cavity and its mating core are intimately inter-related to the design of the molded foam part, recommendations regarding mold design will obviously be applicable to the design of the foam part. In fact, good part design requires the intelligent coordination of both the functional and manufacturing requirements of the foam product.

Part wall thickness. A first consideration in cavity and core design is the wall thickness of the foam part. Wall thickness will determine the geometrical interrelationship between cavity and core and the volume of foam in the part. The proper thickness to use depends on: 1) the functional requirement of the part, 2) the physical properties of the molded foam, 3) the processing properties of the material in the mold, and 4) economic considerations.

Because of the economics, the choice of wall thickness usually involves the determination of the minimum permissible thickness consistent with the first three factors above. Probably the most important of these factors is the processing properties of the molding material.

These properties will depend on the density of the foam desired, the size of the pre-expanded foam beads, and the inherent variation in materials among suppliers.

When one is molding expandable PS, the beads, as received, must first be expanded to a bulk density equal to the foam density desired in the molding. When the pre-ex-

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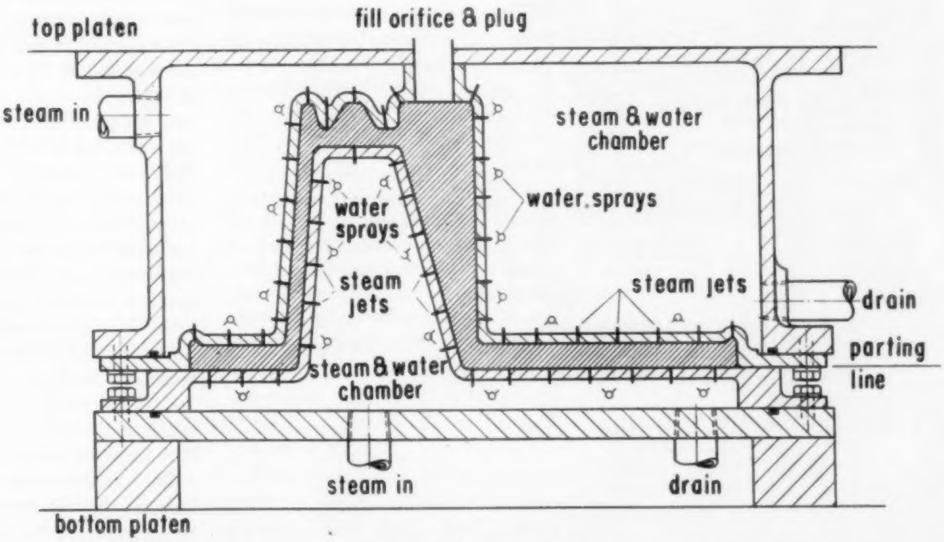

FIG. 1: Square steam chest type of expandable polystyrene foam mold. Steam is admitted to cavity from ports equally spaced on both sides of the cavity. Mold walls carry clamping forces.

panded beads are loaded into the mold they should fill the entire cavity. That is, one cannot place a dense pre-expanded charge into one area of the mold with the expectation that, upon steaming, the charge will expand and flow to fill the mold cavity completely and uniformly with a foam of a lower desired density. Usually the mold will fail to fill completely and/or density will be non-uniform throughout the part. This is because in the fusion process, essentially no flow takes place. The beads and the air which is loaded into the mold with them simply merge into the completed foam structure.

Since the mold must be filled with pre-expanded beads, thickness of part wall, or spacing between cavity and core, must be large enough to allow beads, of a size consistent with the density of the part (or bulk density of the feed to be used), to flow freely into all parts of the mold and pack uniformly within same. Thus, in selecting part wall thickness, the mold designer must have data on the desired density of the foam and the associated pre-expanded bead size.

In addition to providing a basis for selecting wall thickness with regard to processing needs, the desired density of the foam in the part must be known to select wall thickness based on the product's functional requirements.

The physical properties of PS foam will depend on final foam density. Knowing foam density and corresponding physical properties allows part designer, and hence mold designer, to decide on a wall thickness consistent with the service requirements of the part.

Wall thickness will vary, of course, from application to application. In actual practice, wall sections as thin as 1/8 in. have been used on small parts with simple configurations easily loaded with pre-expanded beads. Heavier wall sections, up to 4 in., have been made. Cycles as well as other problems make wall thicknesses above 4 in. inadvisable.

Core and cavity thickness. The next design consideration is the strength of the core and cavity. As shown in Fig. 1, p. 109, and Fig. 2, below, foam molds are hollow in construction. The strength of the cavity and core depends on the metal used and its wall thickness.

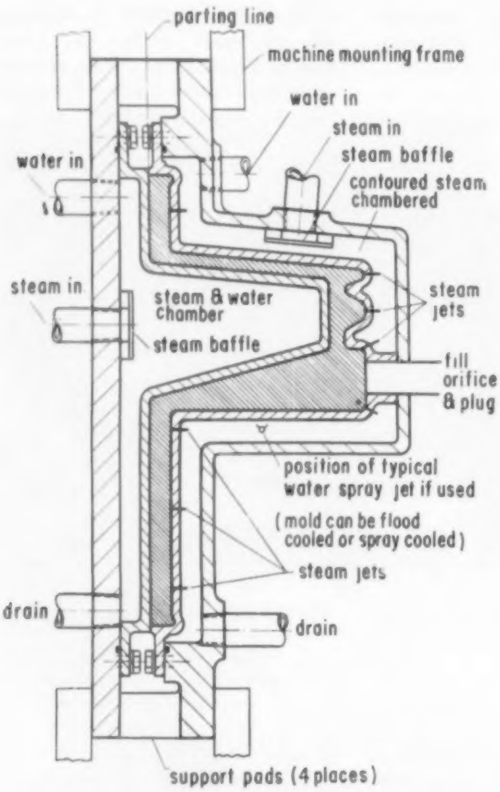

FIG. 2: Contoured steam chamber type of mold for the same piece shown in Fig. 1. Note how walls of steam chamber are roughly parallel to cavity plate contours. Steam ports are selectively located for better steam distribution and a smaller number is used. Clamp forces are borne by support pads. Steam inlets are baffled.

This wall thickness can range from 60 mils to as much as 1/2 in., depending on design and material of construction that is being used for the components.

In foam molding, the expansion pressures exerted on core and cavity normally do not exceed 100 p.s.i.; 40 to 50 p.s.i. seems a realistic general estimate. Please note that the expansion pressure acts in all directions in the cavity, not simply in opposition to the mold clamp. Although expansion pressure will not normally crush or burst the hollow mold, strength is required to provide rigidity and dimensional stability. Thus, in molding large parts, in molds with thin wall sections, adequate support should be given to large spans or the thickness of mold walls should be increased.

Unfortunately, there is little available information on the actual foam expansion pressures exerted in foam molds as a function of steam pressure, foam density, and other variables. Such information would allow better estimates of the minimum mold wall to be used. If actual pressures run below the 100-p.s.i. estimate now used as a rule-of-thumb, thickness can be cut—resulting in better heat transfer and faster cycling molds.

Mold shrinkage. Like all plastics, PS foam shrinks while in the mold and after ejection. Again, extensive data relating shrinkage to molding and post-molding variables is not yet available. In addition to simple thermal shrinkage, shrinkage may also occur as the part, initially wet from the steam and water, dries out after molding. For example, after 10 days in a dry atmosphere at 80° F., a shrinkage up to 20 mils/in. was noticed in a part 12 in. long. This compares with the commonly used mold shrinkage allowance of about 5 to 8 mils per inch. The latter mold shrinkage figure will hold for most cases. However, as indicated, it can vary because of differences in processing and post-molding conditions. It should not be used routinely in the mold design. It is sometimes possible to adjust molding conditions to correct small shrinkage deviations.

In summary, too little is now known about PS foam shrinkage to compensate precisely for this variable by a simple adjustment of mold dimensions. It is strongly recom-

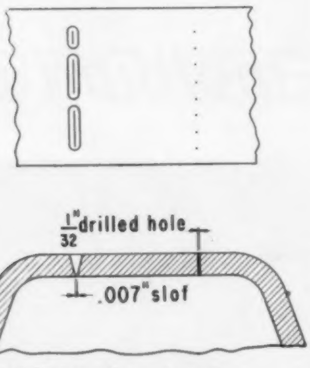

FIG. 3: Schematic section of cavity plate showing two types of steam port design. Tapered slots are recommended over the drilled holes used in the past.

mended that mold and part designers avoid the specification of very close part tolerances if it is at all possible.

Draft and minimum radii. After selecting major cavity and core dimensions, the geometrical details of the part should be reviewed for easy moldability.

Whenever possible, a minimum draft angle of 2° should be used on sides of the mold to facilitate ejection. While it is possible to mold with no draft angle, the piece may often stick. This will decrease production rate and it may also increase the rejects.

Because PS foam is frangible and because expansion pressure forces material into every mold crevice, sharp corners and undercuts must be avoided. The molding cannot be "popped" out of the mold over undercuts. If parts with undercuts must be made, movable cores forming the undercuts must be provided and these must be clear of the piece before ejection begins. However, in view of the hollow steam chamber construction of these molds, provision for side pulls can result in exceedingly complex mold design problems. Thus, if at all possible, undercuts should be excluded entirely in foam molds.

Because of material packing from the expansion and to facilitate filling with pre-expanded beads, generous radii should be provided on all edges and corners in the mold. The minimum radii to use depend on the part thickness relative to the size of the beads fed. In parts with fairly thin walls ($\frac{3}{8}$ in. or less), $\frac{1}{16}$-in. radii can be tolerated. Usually the bead size used for moldings is reduced to facilitate flow and the $\frac{1}{16}$-in. radius will pass beads easily. However, if wall thickness is up to $\frac{1}{2}$ in. or more, then a $\frac{1}{8}$-in. radius is recommended as a minimum. Use a larger radius if possible.

Mold surfaces. As noted, foam frangibility prohibits undercuts. This includes minute undercuts such as scratches or pits. In view of this, cavity and core surfaces should be highly polished. Furthermore, the mold should be polished with strokes parallel to the direction of mold draw or part removal. Only in this way can undercuts be avoided in polishing. It is also important that all traces of polishing compounds be removed afterward, else the first molding may stick fast and the mold will require thorough cleaning before the next shot. This may result in damage to the mold.

Smooth coatings of polytetrafluoroethylene have also been used to prevent sticking in the mold. While these coatings do provide excellent mold release, they have two disadvantages: 1) thick coating will generally slow down the cycle since the coating lowers thermal conductivity of the mold, and 2) a thin coating will wear away rapidly. Also the coating is easily damaged by sharp objects. Once damaged, the coating must then be removed from the mold and the mold disassembled and re-coated.

For long production runs, the mold surfaces are often plated with a hard chrome or hard nickel. This is advisable on molds of softer metal, such as bronze. The hard plating serves to reduce wear and make the surface scratch resistant. Of course, molds should be polished before plating.

Finally, it is possible to produce sharp, molded surface detail, such as lettering, on foam parts. Obviously, the detail should not create undercuts. The size of the detail which can be reproduced in the molding will depend on the surface finish of the mold and the size of the bead fed. The smaller the beads, the smaller the detail that can be achieved.

With small beads, indentations as small as $\frac{1}{64}$ in. wide can be produced. Raised detail $\frac{1}{32}$ in. wide and 30 mils high can be molded. However, this will **(To page 114)**

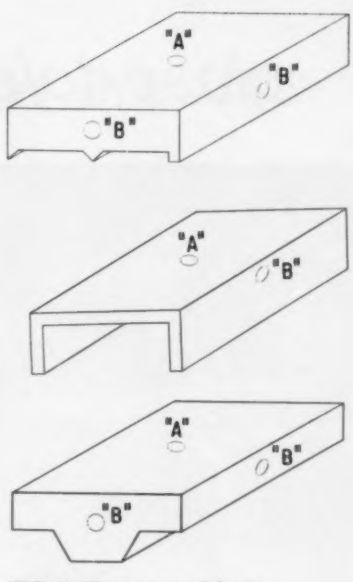

FIG. 4: Three types of foam part designs, all having one flat surface (shown uppermost in the drawings) which allow the molds to be loaded manually in the open position in vertical-acting presses. Pre-expanded beads are then simply poured into the cavity and distributed so that they are level with the flat surface of the mold lands. Molds may also be loaded in the closed position; filling locations are indicated by "A" and "B" as explained in the text of this article.

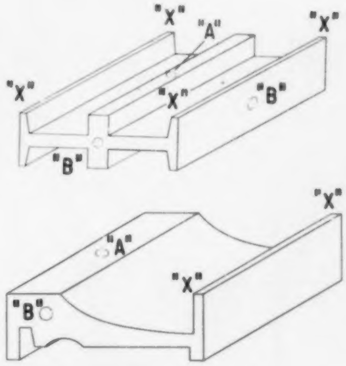

FIG 5: Two types of foam parts having no flat planar surfaces and requiring loading of the mold with the latter in the closed position. "A" and "B" indicate recommended fill tube locations and areas marked "X" will be those most difficult to fill.

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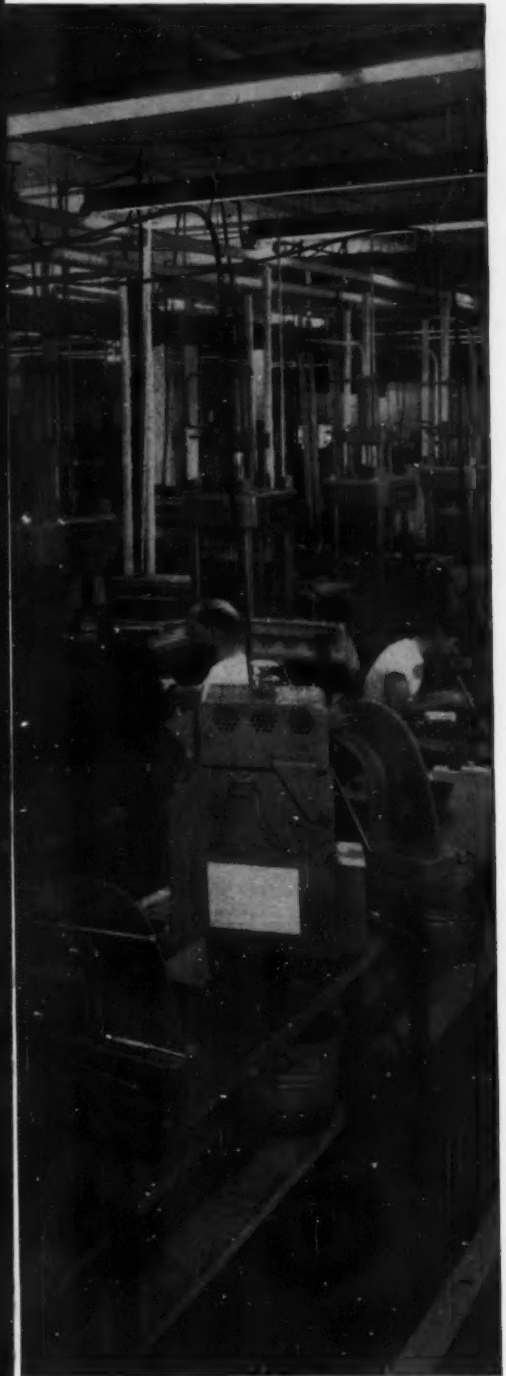

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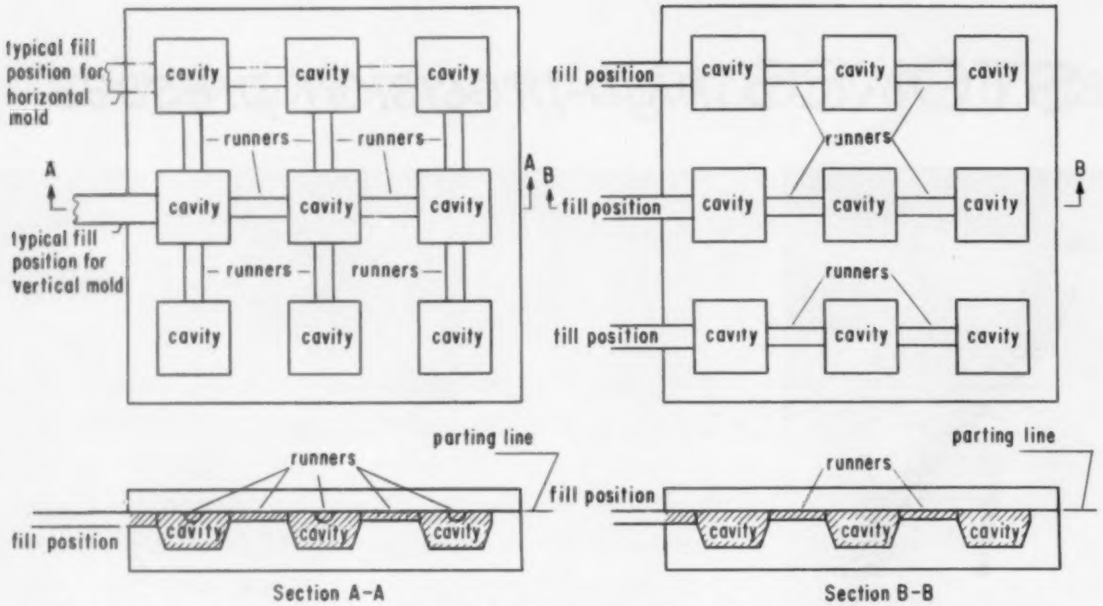


FIG. 6: Multiple-cavity runner-type foam molds. Mold at left uses one filler tube for all nine cavities; mold at right uses one filler tube for each set of three of nine cavities. Both runner systems are prone to blockage and incomplete filling of the mold. In addition, foam scrap is difficult to re-use, resulting in increased material cost.

require dry expansion steam of high quality. Moisture will prevent faithful surface reproduction.

Steam injection orifices

To mold expandable PS with steam, the steam is usually introduced into the cavity proper during the fusion part of the cycle. Foam sections 90 mils thick and thinner can be molded successfully by conduction: the heat from the dry mold surfaces is sufficient to penetrate the product and cause good fusion. Most objects have heavier wall thicknesses. Several methods have been used to feed steam to the cavity. The earliest involved placing large ports in various sections of the cavity-like core box vents used in casting. These ports were usually ½ to ⅜ in. in diameter and consisted of either a wire screen mounted in a round brass bushing or a solid brass bushing containing milled slots.

Steam was admitted to the steam chamber chest and pressure increased until it forced steam into the cavity through the ports. A disadvantage of this design was that surface appearance of the product was marred by blotches caused by these ports. To overcome this, multiple drilled holes were used next. These holes were usually about 1/32 in. across and spaced 1 in. apart. This resulted in a great number of tiny pips, which, although less visible than the large ports, still marred the surface. Drilled holes are still used and are sometimes the best design, but in many molds a new design is now used. This involves the use of slots shaped as shown in Fig. 3, p. 111. The slots are tapered from about ⅛ in. on the steam side of the cavity down to 5 to 7 mils on the cavity side. This design offers several advantages: 1) the 5- to 7-mil-wide discharge slot results in better part surface; 2) the taper reduces restriction of steam flow; and 3) and perhaps more important, steam distribution into the product is better than with a circular jet. This promotes better foam fusion with less steam consumption. Another advantage is that less steam condenses as it passes through than with any other design.

As important as the design of the steam orifice is the number and correct placement of ports in the cavity. In the past, many more orifices

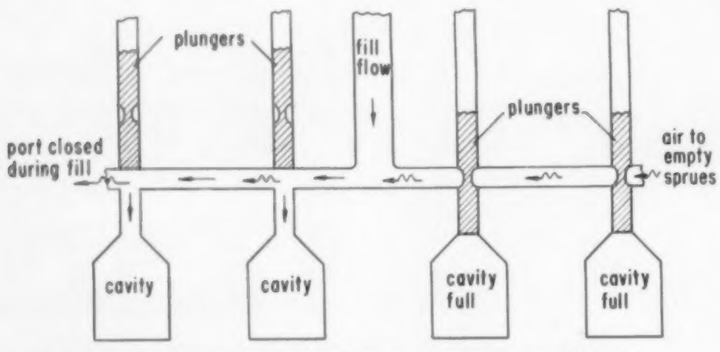
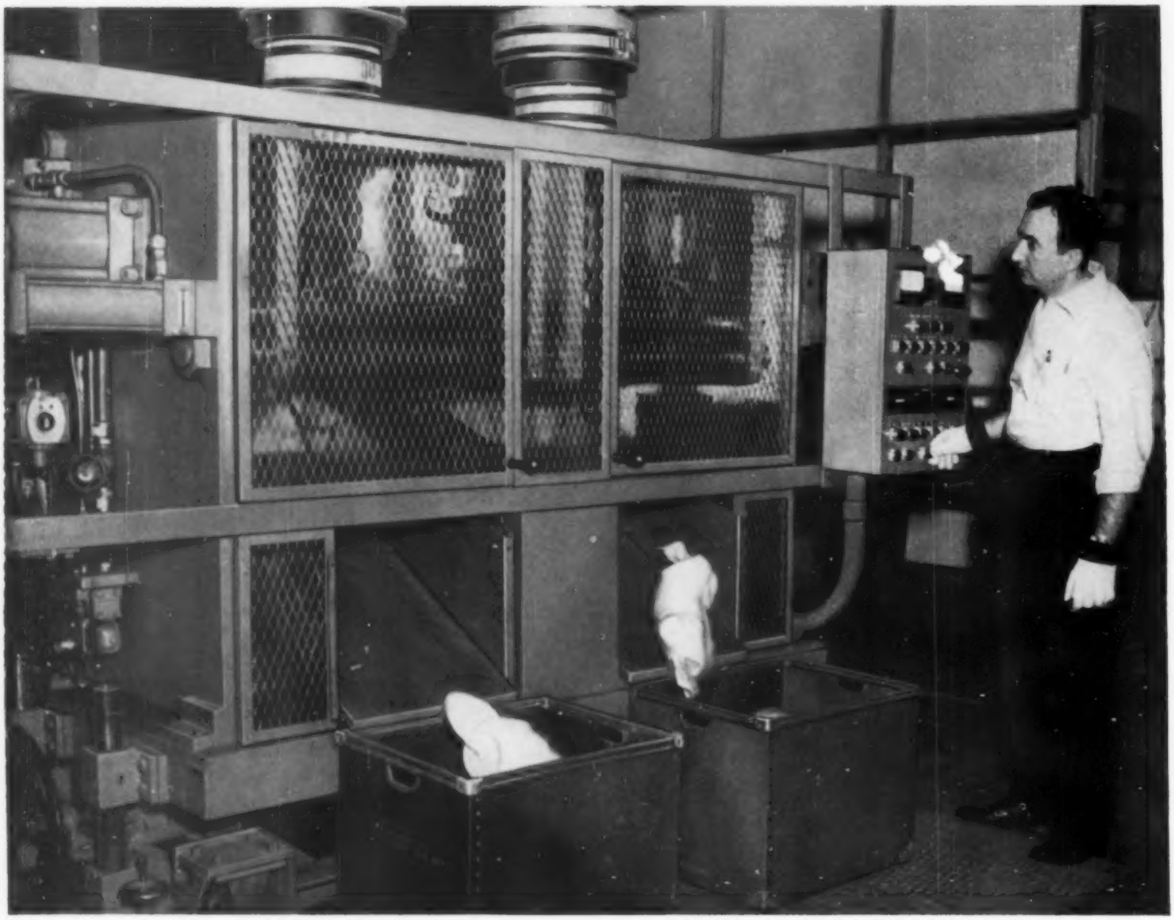
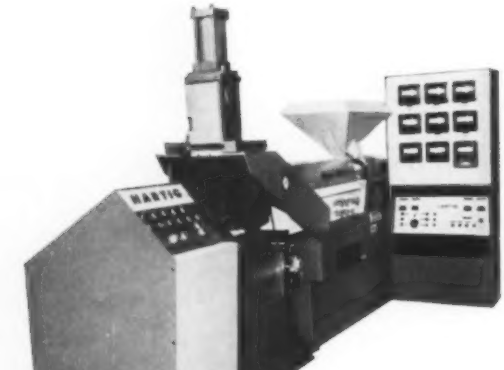


FIG. 7: Special runner-type mold designed to conserve material. All cavities are fed from a single filler tube when plungers are retracted, as shown at left of filler tube. After cavities are filled, plungers advance and excess material is blown out of runner (shown horizontal in the drawing). Advanced plungers are shown at right with the hole in each plunger aligned with runner, allowing it to be swept free of beads.





were used than were really required, mainly because molds were sealed poorly and steam chambers were too large. This required an excess of steam to ensure that sufficient heat passed into the mass of beads. However, with better mold design, it is possible to greatly reduce the number of steam ports. In some molds where 100 steam ports were formerly used, the same mold now operates better when there are only 10 or 12 ports.

The use of too many steam holes increases cooling time. In molding foam, cooling must bring down the center of the molding to a temperature at which residual expansion pressure will not swell the object after ejection. If the center temperature is initially raised above that needed to fuse the beads, more heat will have to be removed before the part can be ejected. By actual test, reducing the number of steam ports has cut cooling time up to 40 percent. Shorter cycle often means that fewer cavities can be used for the production needed at lower initial mold capital cost.

Orifice location should be chosen with care. There are few hard and fast rules that can be made, except the following:

1. Try to place steam ports on only one side of the mold, on either core or cavity. Ports on both sides may result in trapping condensate in the middle of the article.

2. Place the ports so that steam penetrates all cavity areas. If possible make it flow toward mold parting lines. This allows steam and condensate to escape at the start of the cycle and usually results in a drier molding.

3. Place more steam ports in thick sections and less in thin sections. Comparing Figs. 1 and 2, it will be seen that in the square steam chamber in Fig. 1, holes are placed indiscriminately. If the steam were dry (improbable with so large a chamber), then thin sections would overcook and heavy sections would not fuse. In Fig. 2, placement of holes is better and the cavity will rapidly fill uniformly with steam.

4. Remember that effective steam penetration is about 4 in.; any greater depth requires steam from both sides. To prevent excessive condensation entrapment, it is important steam from each side should be introduced sequentially. Careful steam port placement will ensure economical use of steam and cooling water. It is always better to put in less holes than are needed, and to add more later if really required.

Filling considerations

There are several ways to fill the mold. Fig. 4, p. 111, shows flat moldings which can be filled by hand prior to closing the mold. This can be done on simple moldings where one surface of the part is flat or almost so. Fig. 5, p. 111, shows parts without flat surfaces that cannot be filled by hand. Since foam will not flow, sections having protrusions which will squash the beads must be avoided; if beads are squashed they will not expand. Parts having **(To page 120)**

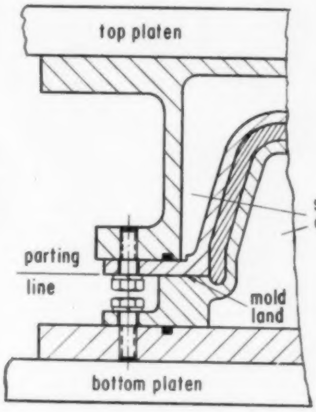


FIG. 8: Mold land design in box-type steam chest mold. Mold walls are required to carry clamping forces. Width of land also offers high resistance to escape of air and steam.

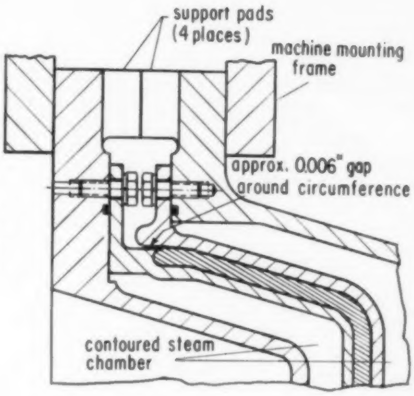


FIG. 9: Mold land design for contoured steam chamber mold made by either casting or machining. Clamp force is borne by support pillars and land is made thin to facilitate escape of air and excess steam used for pre-heat and fusion.

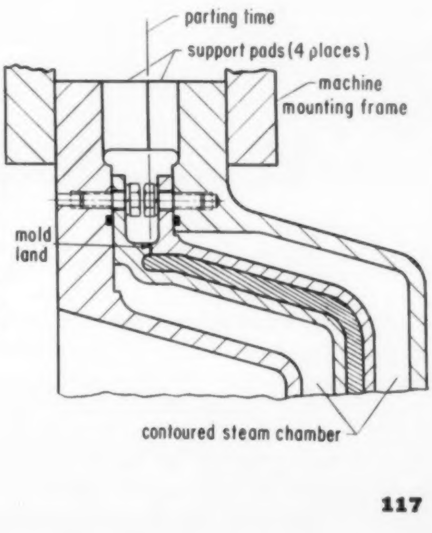


FIG. 10: Contoured steam chamber mold made by hydroforming. Force plate is tapered so that core of mold enters the cavity of the mold similar to a positive compression mold. Clamp forces are borne mainly by the support pillars. This design allows accurate control of the mold gap.

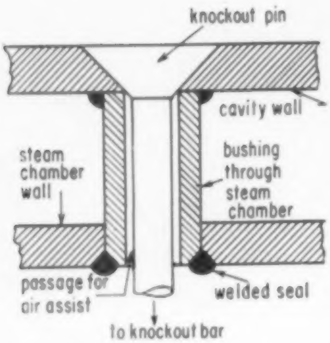


FIG. 11: Sketch showing recommended ejector pin design for mechanical ejection with air assist. Note how the ejector pin tube, or sleeve, must be sealed as it passes through the steam chamber to prevent steam and water leakage. Back taper on knockout pin allows expansion pressure to seal the knockout pin during the molding cycle.

such sections must be filled after the mold is closed; positions for feed ports are shown at *A* and *B* (Figs. 4 and 5). Both simple and complex molds can be satisfactorily filled after closing by blowing the beads in with air or sucking them in by evacuating the cavity. In the former case, the mold has to be "cracked" open a few mils to allow filling air to flow through the mold. In the latter case it must be completely sealed so that a vacuum can be created in the cavity to pull the pre-expanded beads into the mold.

Fig. 6, p. 114, shows two methods of filling molds using gates and runners. At left, a 9-cavity mold is filled through only one inlet. Material flows in from the fill inlet and is passed first to the cavity farthest away, gradually backing up to fill the whole mold. At right, each group of three cavities is provided with a separate feed tube. Both systems are only partly successful since blockage can occur between cavities and prevent complete mold fill. Although this can be true of any fill system, poor fill is a considerably greater possibility in runner-fed multiple-cavity molds.

Another big disadvantage of the runner system is that foam runners cannot be recycled. Ground foam scrap can only be used in fairly thick moldings and then to not more than 10% of total material. Use of scrap also can result in poorly expanded products.

Fig. 7, p. 114, shows another adaptation of runner or gate filling. In this method, runners are removed prior to the molding cycle. At the left of Fig. 7 plungers are withdrawn and material flows directly into the cavities. Once cavities are filled (to right of Figure), the plungers advance and seal the gate to the cavity. At the same time, a hole through the plunger is aligned with the runner and an air blast blows out the excess material. At the end of the cycle, the products are ejected without runners attached. A major problem in this system is that compression of the beads can occur at the point under the plunger in the mold cavity. If expandable PS beads are excessively compressed after pre-expansion, this inhibits proper expansion resulting in poor fusion, non-uniform density, and weakness in the part at the gate. Also extensive experience indicates the rejection rate in this particular method is high—it sometimes exceeds 30 percent.

In any of the above methods, vacuum or air can be used; however, vacuum will often give much slower fill and the possibility of poor fill will be greater. With vacuum, land areas of the mold must be sealed. This results in much wetter moldings since condensate cannot escape and is occluded in the finished molding.

One consideration that led many companies to adopt runner systems is cost. It is thought that feeding all cavities using one fill device reduces cost considerably. While this is true, it is also true that each cavity may have its own fill device if the devices are standard items interchangeable among several molds and can be used on different jobs.

While this appears expensive, molds can usually be filled in little over one second, whereas filling a 9-cavity runner-type mold can take 10 to 15 sec. or more for a similar object. Thus, saving in cycle alone can more than offset the increased cost of having a filler unit for each cavity in the mold.

The next problem is location of the filler orifice in the cavity. In Fig. 4 the ideal location for all three molds (bearing ejection problems in mind) is at *A*. At *A*, no blemishes or protrusions from the fill plunger will be left to interfere with ejection.

On solid platen machines, gating at *A* can be used, but a hole must be drilled in the platen to insert the filler nozzle. However, this is usually inadvisable, since more holes must be drilled with every change in nozzle location. With solid platen machines it is usually better to gate the part in a position perpendicular to the mold draw such as indicated at *B* in Fig. 4.

In moldings shown in Fig. 5, an automatic fill device coordinated with the cycle is a necessity. Once again position *A* is the ideal gate location. Areas on both objects marked *X* will be most difficult to fill, therefore, a vacuum should be pulled through the steam ports to aid the fill. Accordingly, care should be taken in laying out steam ports to place them in areas difficult to fill. This technique will assure complete fill almost every time.

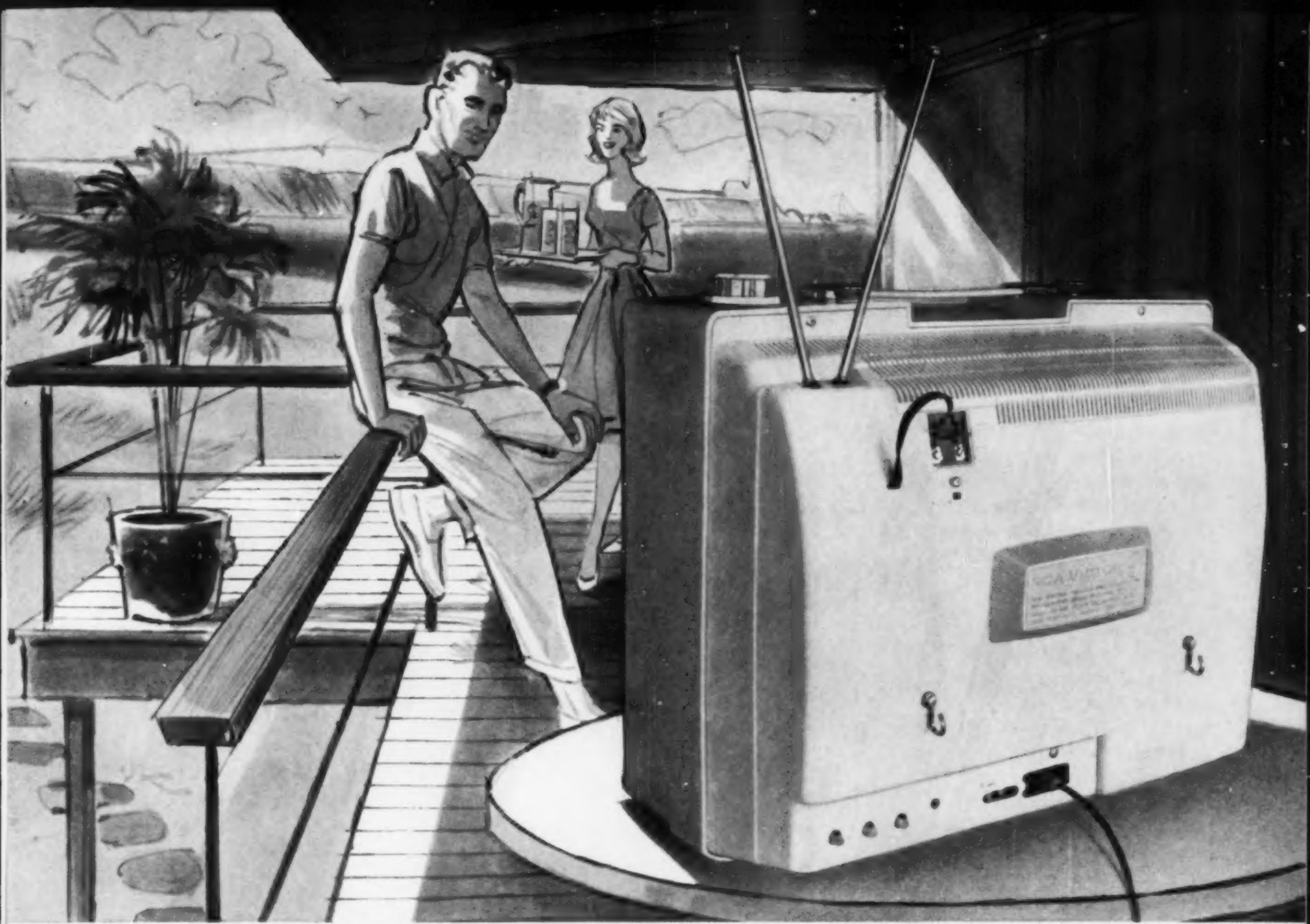
Although complete fill is also possible from gates at *B*, ejection will be difficult for the reasons that were given previously.

Regardless of filler tube location or system used, the terminal diameter of the tube should never exceed the wall thickness of the product at the filler orifice. If the diameter of the tube is too large, a small excess of beads will be fed with each shot, due to the characteristics of the beads. This will result in packing of the beads.

Another feature to avoid is placing the filler orifice to feed directly into a dead-end section. This causes incoming beads to pile up and block further flow into the mold. The important point to remember in any filling operation is that smooth bead flow is essential and any turbulence should be avoided. Turbulence usually lengthens fill time and can prevent complete fill.

Heating and cooling

A complete foam molding cycle requires the mold to be cycled from about 60 to 70° F. to about 230° F., and down again, as quickly and efficiently as possible. The mold depicted in Fig. 1 is designed specifically for a typical vertical-acting press with solid platens; the mold in Fig. 2 is built for a horizontal-acting clamp machine with a grid mold-mounting system. The mold in Fig. 1 has a box- **(To page 208)**



The back panel for the RCA Victor portable television set is molded of Tenite Polypropylene by Amos Molded Plastics, Division of Amos-Thompson Corp., Edinburg, Indiana.

A great show by a plastic—
TENITE POLYPROPYLENE

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What's the best blow-up ratio?

By Joseph F. Pilaro*, Richard J. Kremer*, and Louis A. Kuhlmann*

Few attempts have been made to analyze scientifically the variables of blown film extrusion. The many controllable variables and measurable properties in blown film have been the major deterrents to a complete treatise on the subject. Recent work involved a statistical analysis of the effects of blow-up ratio on the optical and strength properties of blown polyethylene film. In addition to supporting previously published data on blow-up ratio (1–2)[1], the work, reported in this article, covers some theoretical aspects of the variable and delves into the economics of selecting the optimum blow-up ratio in a commercial shop.

Any study of blow-up ratio must begin with a definition of the term as the investigator will use it. The use of more than one definition in the past has caused confusion when attempting to compare the results of several sources.

Blow-up ratio, as used here, describes the degree of expansion imparted to the polyethylene (PE) tube while blowing it from its original diameter, as it leaves the die, to the final film circumference. Blow-up ratio may be expressed as:

$$\text{Blow-up ratio} = \frac{\text{bubble diameter}}{\text{die diameter}}$$

$$= \frac{2 \times \text{blown film width}}{\pi \times \text{die diameter}}$$

The dimensions above are defined in Fig. 1, below.

Bubble diameter must not be confused with the width of the flattened tube of blown film between the nip rolls or on the windup roll. The width of this flat tube is 1.57 times the bubble diameter. From these relationships, the following formulas can be derived:

$$\text{Blow-up ratio} = (0.637) \frac{(\text{blown film width})}{(\text{die diameter})}$$

and

$$\text{Blown-film width} = (1.57)\ (\text{die diameter})\ (\text{blow-up ratio})$$

These two formulas can be used to calculate either the blow-up ratio or the blown film width on the windup roll if the other figure is given and the die diameter is known. Other definitions of blow-up ratio do not enable accurate scale-up of effects for all die sizes and all film widths.

The theoretical significance of blow-up ratio can best be expressed in terms of orientation of the highly stressed extrudate. Blow-up ratio, in combination with haul-off rate and die opening, determines the degree of biaxial orientation of the film. As the hot film is pulled from the die by the haul-off unit, it is stretched (oriented) in the direction of pull (machine direction). Expansion of the hot film bubble by blowing stretches (orients) the film in the direction perpendicular to face of die (transverse direction).

It can be theorized that the degree of blow-up, or blow-up ratio, affects optical and physical properties of the blown film because it affects orientation. Balanced orientation should provide balanced strength properties, such as uniform tear propagation, in both machine and transverse directions. Choice of optimum blow-up ratio or ratio range should then provide optimum film properties at economical haul-off rates and commercially feasible extruder outputs.

As has been suggested (1) some changes in film properties observed when blow-up ratio is changed may really be due to other variables which are changing without the operator's knowledge. Insofar as is possible, interactions of this type have been eliminated in this study.

The statistical problem

To determine statistically the effects of blow-up ratio on blown film properties, a randomized ex-

* Respectively: Assistant Group Leader—Customer Services, Customer Service Engineer, and Assistant Customer Service Engineer, U.S.I. Polymer Service Laboratories, Tuscola, Ill.

[1]Numbers in parentheses denote references at end of article, p. 220.

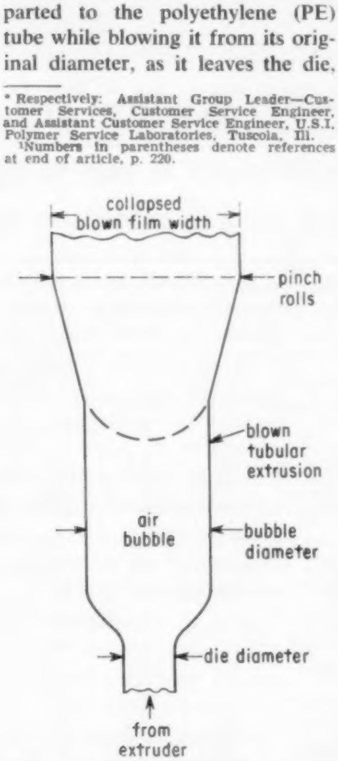


FIG. 1: Schematic drawing showing significant dimensions to be used in calculating blow-up ratio.

Table I: Resins used to study the interaction of melt index and density with the effect of blow-up ratio on PE film properties

Resin number[a]	*Melt index*	*Density*
	g./10 min.	*g./cc.*
200	3	0.916
201	5	0.916
203	8	0.916
205	3	0.924
206	5	0.924
207	8	0.924
9300A	3	0.929
239	5	0.929
240	8	0.929

[a]Numbers designate Petrothene resins made by U. S. Industrial Chemicals Co., Div. of National Distillers & Chemical Corp., 99 Park Ave., New York 16, N. Y.

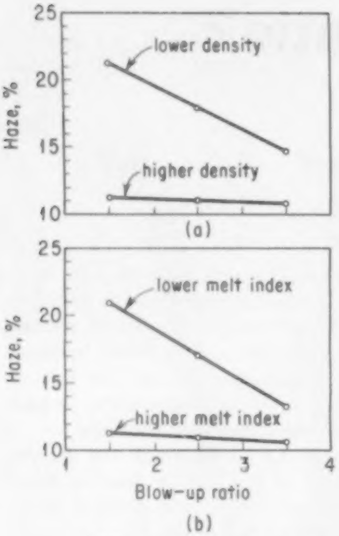


FIG. 2: Effect of blow-up ratio, resin density, and resin melt index on the haze of blown polyethylene film made using a constant haul-off speed. Density effects are shown in 2a; melt index effects in 2b.

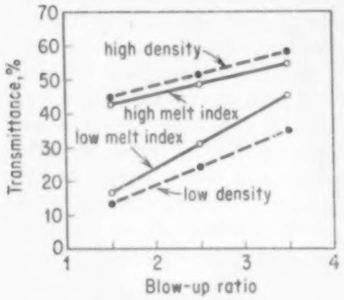


FIG. 3: Relationship between light transmittance of blown film and blow-up ratio also showing the effects of changing resin density and melt index. All data collected using constant screw speed.

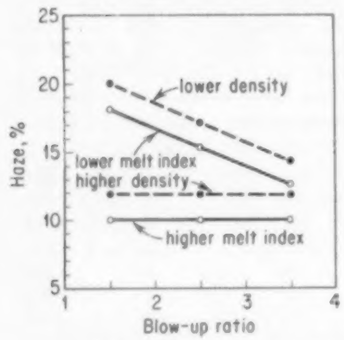


FIG. 4: Effect of blow-up ratio, resin density, and resin melt index on the haze of blown polyethylene film using constant screw speed.

periment was performed. Included in the experiment were runs designed to determine whether blow-up ratio effects depended on the melt index and density of the resins.

The nine resins studied are listed in Table I, p. 123. These resins covered the range of melt index and density generally used for blown film extrusion.

Each resin was run at blow-up ratios of 1.5, 2.5, and 3.5. In order to maintain film thickness at 1.5 mils, one set of 27 runs was made by adjusting haul-off rate at a constant screw speed of 34 r.p.m., and a second set of 27 runs was made by adjusting screw speed at a constant haul-off rate of 34 ft. per minute. Thus, the experiment minimized the possibility of confounding interpretation due to varying melt homogenization at different screw speeds or varying film annealing at different haul-off rates.

The randomized runs were made using a 2½-in.-diameter Hartig Lo-Boy extruder with a 20:1 L/D ratio. The screw was a PE-type with 5 metering flights, 12 tapered compression flights, and 3 feed flights. Compression ratio was 4:1.

A 4-in.-diameter, side-fed, Hartig die, with 20-mil opening and 0.5-in. land length, was used for all runs. Melt temperature was set at 310° F. for all runs using Wheelco Model 402 time proportioning controllers; four located on the extruder barrel, one on the die adapter, and three on the die.

An Egan blown film haul-off and twin-turret winder were used. The air ring, a 6-in.-diameter Hartig design with a horizontal air exit, was positioned on the die face.

Blow-up ratio was varied by changing film width since dies of different size with identical geometry were not available. The data obtained, therefore, do not prove that changing blow-up ratio by changing die diameter would have the same effects as shown here. However, the field experience of the authors indicates that this is actually the case.

Film properties studied using samples from each of the 54 experimental runs were measured using ASTM test methods.

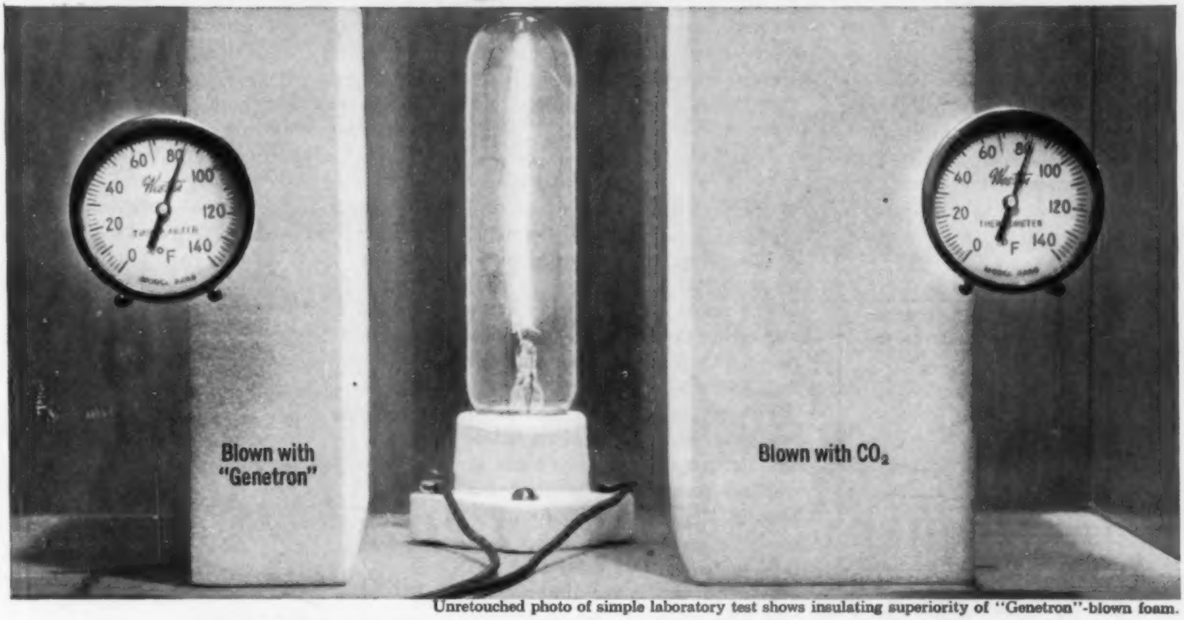
Results

All optical properties studied were found to be significantly affected, with 99% confidence limits, by blow-up ratio. In the series of runs at constant haul-off rate, an increase in blow-up ratio from 1.5:1 to 3.5:1 linearly increased light transmittance, or clarity, from 31 to 49% as an average for all resins tested without regard for melt index or density. The increase in transmittance, due to blow-up ratio, of resins at any one density level was significant at the 95% confidence level in the series of

Table II: Effect of blow-up ratio on the appearance and impact properties of blown films made from five different polyethylene resins recommended for blown film use by four different material suppliers

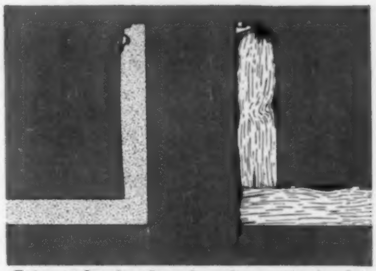
Resin	*Density*	*Melt index*	*Blow-up ratio*	*Light transmission*	*Gloss*	*Haze*	*Dart drop impact*
	g./cc.	*g./10 min.*		*%*	*%*	*%*	*g./1.5 mil*
A	0.925	1.3	1.5	54.1	8.6	8.0	50
			2.5	59.2	9.4	7.6	97
			3.5	61.2	9.5	6.7	129
B	0.921	2.4	1.5	39.7	7.9	9.1	48
			2.5	52.3	9.0	6.2	90
			3.5	51.5	9.4	6.2	133
C	0.922	2.4	1.5	55.2	8.2	9.1	66
			2.5	57.6	9.0	7.1	68
			3.5	62.5	9.5	6.2	95
D	0.921	3.1	1.5	51.1	8.5	9.4	76
			2.5	52.3	8.6	8.2	87
			3.5	61.0	8.9	7.4	87
E	0.925	1.7	1.5	38.4	7.6	8.5	73
			2.5	34.4	8.5	7.2	54
			3.5	44.5	9.5	6.7	90

Half the "k"-factor of ordinary urethane!



Unretouched photo of simple laboratory test shows insulating superiority of "Genetron"-blown foam.

Insulation of **genetron**®-blown foam is up to twice as effective as carbon dioxide-blown foam... more than 2 times as effective as glass wool batting.



Cutaway drawing shows how the superior insulating properties of foamed-in-place "Genetron"-blown urethane foams save space in refrigerators, freezer boxes and other applications. Storage capacity can be increased on the order of 20% without increasing outside dimensions.

Now there's a new and better way to make urethane foams for thinner wall insulation . . . with "Genetron" blowing agents. "Genetron"-blown foams offer far superior insulating performance—as much as 2 times the insulating value of CO_2-blown foam and 2½ times that of glass wool batting. With "Genetron"-blown urethane, storage capacity of refrigerators and freezers can be increased on the order of 20% without increasing outside dimensions.

"Genetron"-blown foams offer many important working advantages, too. They rise at lower temperatures, permitting larger forms to be prepared. They are easier to control, because "Genetron" does not react chemically with other constituents. They cure rapidly, even at room temperature. They are safer... release less of the toxic vapors and no flammable vapors.

In addition, when foamed in place, "Genetron"-blown urethanes provide all the structural advantages of ordinary urethanes . . . stronger construction . . . better support for deep cavity liners.

For further information write for General Chemical's comprehensive technical bulletins, "Genetron Blowing Agents for Rigid Urethane Foam," and "Determining Genetron Content of Rigid Urethane Foam."

Other major components of the urethane foam system are also produced by Allied Chemical. These components are: Nacconate® diisocyanates by National Aniline Division; polyester resins by Plastics and Coal Chemicals Division.

Allied Chemical

GENERAL CHEMICAL DIVISION
40 Rector Street, New York 6, N. Y.

runs that was made at a constant haul-off rate.

As shown in Fig. 2a and 2b, p. 124, an increase in blow-up ratio decreases or improves the haze of PE films, this effect being more pronounced with the resins of lower melt index and lower density studied than with those of higher melt index or higher density studied at constant haul-off rate.

Increasing blow-up ratio from 1.5:1 to 3.5:1 produced a linear increase in gloss (significantly at 99% confidence levels) from an average of 5.7 to 6.6% for all resins, regardless of melt index or density. Care must be taken in considering the absolute values of the numbers reported for haze, gloss, and transmittance because individual values for each resin studied are not reported. Only averages are reported to fulfill the purpose of the study, *i.e.*, to determine the general effects of increasing blow-up ratio.

Figure 3, p. 124, shows the effects of blow-up ratio on transmittance of film made at constant screw speed, varying haul-off rate to obtain constant film thickness. As seen by the slope of the lines, an increase in blow-up ratio had the greatest effect of increasing transmittance on resins of lower melt index and lower density.

Haze was improved, or decreased, in a manner similar to that of transmittance in the set of runs at constant screw speed. Figure 4, p. 124, shows that increasing blow-up ratio had no effect on the haze of the resins of higher melt index and higher density, but significantly reduced the haze of those of lower melt index and lower density.

For all resins studied, and at all conditions of screw speed and haul-off rate, gloss of the films made at constant screw speed is improved linearly from about 5.6 to 6.5% (with 99% assurance) as blow-up ratio increases from 1.5:1 to 3.5:1. This one factor is the most significant revelation of this study, for today, sparkle or gloss is *the* eye-appealing selling point of PE film packages. A film producer desiring to obtain maximum appeal in the packaging materials he sells should design his machinery to operate in the high end of the blow-up range, not at the 1.2:1 or 1.5:1 level.

In the series of experiments run at constant haul-off rate, no significant change in yield strength, in machine and transverse directions, was noted at either the 99 or 95% confidence limits with increasing blow-up ratio. Tensile strength at break decreased in the machine direction and increased in the transverse direction, as shown in Fig. 5, above. Average elongation at break increased linearly in the machine direction and decreased linearly (with 95% confidence) in the transverse direction. These changes in average strength properties indicated the more balanced orientation in the film as blow-up ratio was increased from 1.5:1 to 3.5:1.

The average dart drop impact strength of all films at constant haul-off rate made from resins of **3, 5, and 8 melt index and 0.916, 0.924, and 0.929 density, increased linearly from about 70 to 110 g./1.5 mil as blow-up ratio increased from 1.5:1 to 3.5:1 at the 99% confidence limits.**

The series of experiments run at constant screw speed, with blow-up ratio at 1.5:1, 2.5:1, and 3.5:1 confirmed the trends in physical property improvement discovered in the series of runs at constant haul-off rate. Yield strength was not significantly changed, machine direction tensile at break decreased, transverse direction tensile increased, as shown in Fig. 6, left. Transverse and machine direction elongation values showed a similar but reversed trend with increased blow-up ratio.

Dart drop impact strength increased when the blow-up ratio was increased from 1.5:1 to 3.5:1, for the resins of lower melt index, but did not change significantly with the higher melt- **(To page 218)**

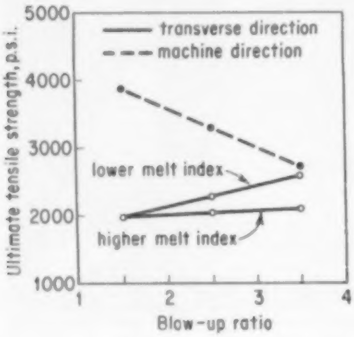


FIG. 5: Graph showing effects of blow-up ratio and resin melt index on the ultimate tensile strength of blown polyethylene film in the machine and transverse directions. All data obtained using constant haul-off rate mode of operation.

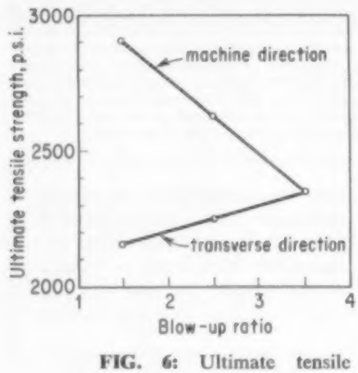


FIG. 6: Ultimate tensile strength of polyethylene blown film as a function of blow-up ratio at different melt indices. Data was obtained using constant screw speed. Trend applies to all resins studied.

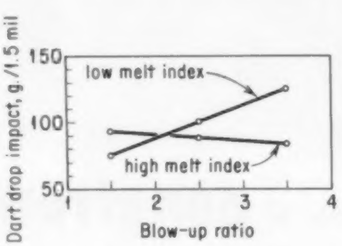


FIG. 7: Dart drop impact strength of PE blown film as a function of blow-up ratio at high and low melt indices. Data obtained using constant screw speed.

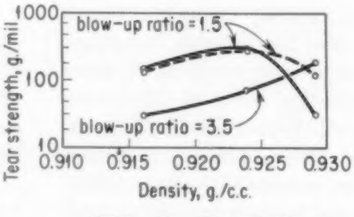


FIG. 8: Elmendorf tear strength of blown polyethylene film in the machine direction as a function of density using high and low blow-up ratios and both constant haul-off and constant screw speed modes of operation. Constant screw speed data is shown with a dashed line; this coincides with constant haul-off data at higher blow-up ratio.

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Suggested Formulation for Flame Retardant Plastisol

	Parts
Diamond Alkali PVC-70	100
DIOP	18
Santicizer 141 (1)	45
Chlorowax LV	10
Antimony Trioxide	10
Tinuvin P (2)	0.05
Mark KCB (3)	2.5
Paraplex G-62 (4)	5

(1) Monsanto Chemical Company (3) Argus Chemical Corporation
(2) Geigy Chemical Corporation (4) Rohm and Haas Company

Viscosity	Brookfield Model RVT-200 #6 Spindle 100 RPM
Initial	29.8 poises @ 77° F
48 Hours	44.0 poises @ 77° F
Brittle Point	−47° C
Fadeometer	No discoloration after 300 hours
Diamond Alkali Loop Test	No Spew

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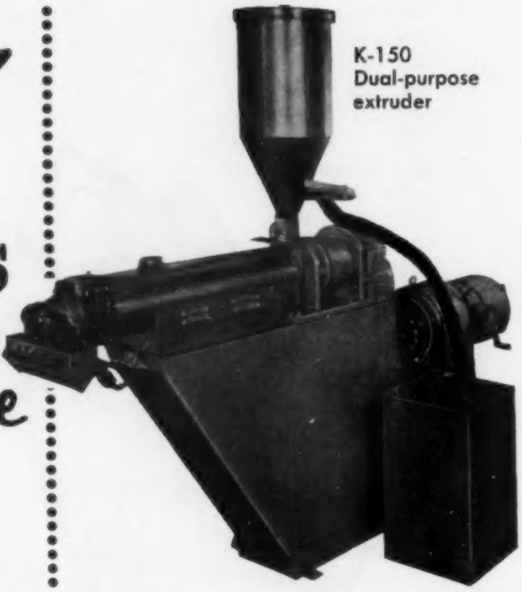

K-150 Dual-purpose extruder

Model Number	K-75* Bench style	K-100*	K-150	K-250	K-350*
Nominal Screw Diameter—Inches	.75	1.00	1.50	2.50	3.50
L/D Ratio	16 - 1	24 - 1	24 - 1	24 - 1	24 - 1
	20 - 1	20 - 1	20 - 1	20 - 1	20 - 1
*Recommended Drive—H.P.	3/4	1	5 - 7	20	30 - 40
Type of Transmission	Worm	Herringbone	Herringbone	Herringbone	Herringbone
*Screw Speed Range—RPM	20 - 60	15 - 120	12 - 100	10 - 80	10 - 80
Materials: a. barrel	Xaloy				
b. screw	Heat treated alloy—flame hardened lands or nitride hardened stainless steel				
Number of Heating Zones on Barrel	2	2	3	3	3
Maximum Output—lbs.—Per Hour	6	20	60	150	250
Approximate Floor Space—Inches	27 x 12	29 x 16	80 x 18	88 x 26	115 x 40
Approximate Weight—lbs.	120	400	1200	3500	5500

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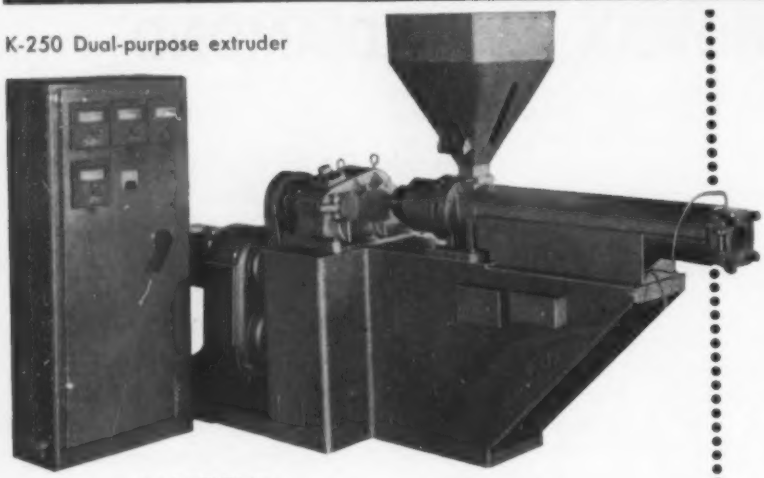

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Properties and uses of very high-molecular-weight, high-density polyethylene

By W. E. Gloor†

The first high-density polyethylene made by Prof. K. Ziegler (1)[1] was of very high molecular weight. Much of the process development, which culminated in the commercialization of high-density polyethylene, such as Hi-fax[2] in the U.S., and Hostalen[3] in Germany, was devoted to modifying the original procedures to obtain polymers of lower molecular weight. Such polymers have flow properties that make them adaptable to conventional plastic fabrication techniques such as blow molding, injection molding, and extrusion, at some sacrifice of the very high toughness shown by the first moldings of the early Ziegler materials.

Continued study of the process led to the discovery of interesting and novel properties of some of the high-molecular-weight polymers that can be produced commercially in existing plant equipment. The purpose of this article is to describe these properties and to indicate some present and potential uses of the material.

Molecular weight

The relationship between the intrinsic viscosity of unfractionated high-density polyethylene in Decalin at 135° C., and the weight-average molecular weight M_w under that condition (2) is:

$$[\eta] = 6.77 \times 10^{-4} (M_w)^{0.67} \quad \text{Eq. 1}$$

One way of characterizing a high-density polyethylene for control purposes is measurement of its reduced specific viscosity (RSV). The RSV is obtained by measuring the specific viscosity of a 0.05 to 0.10% solution of polyethylene in Decalin at 135° C., applying a correction to reduce the results to zero shear, and dividing by concentration c expressed as g./100 ml. of solution at 135° C. Hence RSV $= \eta_{sp} / c$ at zero shear. An approximate relationship (3) of RSV to intrinsic viscosity $[\eta]$ is:

$$\text{RSV} = [\eta] + 0.07 [\eta]^2 \quad \text{Eq. 2}$$

Equation 2 holds experimentally for RSV's from 1 to 12. From Equations 1 and 2, Fig. 1, below, was constructed. The weight-average molecular weights of commercial polyethylenes made by procedures based on Ziegler's work lie between 100,000 and 500,000 at RSV's from 1.7 to 6. Some of the early Ziegler samples had RSV's of 40 or more. The high-molecular-weight, high-density polyethylenes (Hi-fax 1900) described in this article have RSV's from 25 to 30; that is, weight-average molecular weights estimated to range from 2 to 3 million.

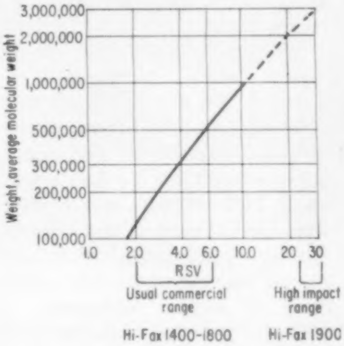

FIG. 1: Relationship between reduced specific viscosity (RSV) and weight-average molecular weight of Hi-fax-type polyethylenes.

Difficulties in applying the usual fractionation techniques and light-scattering methods prevent an exact statement of the molecular weight distribution, M_w/M_n, for these polymers. From knowledge of the process and of the way this ratio varies with RSV, the M_w/M_n ratio for the 1900 polymer is estimated to be greater than 10.

Flow properties

Apparatus commonly used for characterizing polyethylene for flow properties, such as the melt index tester (4) and the high-shear viscometer (5) developed by Canadian Industries Ltd. (hereafter called the "C.I.L. tester"), fails to give measurable flows of the 1900 polymer when operated at customary levels of pressure and temperature with the usual orifices. When the C.I.L. tester was provided with a capillary measuring 0.0825 in. in diameter and 0.315 in. long, and operated at 300° C., some measurements could be made. The upper molding temperature for 1900 type polymers is 282° C. (550° F.), when no precautions are taken to exclude air. However, in the C.I.L. tester, the pressure is applied by means of nitrogen acting against a steel ball, which serves to force the melt through the orifice. Hence, these measurements at

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*Reg. U. S. Pat. Off.
† Hercules Powder Co.
[1]Numbers in parentheses link to references at end of article, p. 221.
[2]Hi-fax is a registered trademark of Hercules Powder Co.
[3]Hostalen is a registered trademark of Farbwerke Hoechst A.G.

Table I: Impact behavior of Hi-fax 1900 specimens

Reduced specific viscosity of Hi-fax	*Bar appearance after impact*	*Energy absorbed*	*Equivalent energy absorbed*
		ft.-/lb.	*ft.-lb./in. of notch*
26	No break	7.25	29+
26	No break	6.50	26+
8	Broken	1.3	5.2[b]
3/1 26 and 8[a]	No break	6.50	26+

[a]A true impact strength since bar was broken. [b]A 3-to-1 blend of polymers of RSV 26 and 8, respectively.

Table II: Properties of compression-molded polyethylenes

Property and ATSM method	*Hi-fax 1901 and 1906*	*Hi-fax 1800*
Specific gravity	0.939	0.945
Melt index (D 1238)	Nil	*ca.* 0.05
Weight-average molecular weight	*ca.* 2×10^6	*ca.* 5×10^5
Crystalline melting point, °C.	130 to 131	129 to 130
Izod impact strength[a] (D 256), ft.-lb./in. of notch		
At 73° F., 8.3 ft.-lb. hammer	15+[b]	4 to 5
At −40° F., 4 ft.-lb. hammer	No break at 16	1.2
At −40° F., 8.3 ft.-lb. hammer	18	1.0
Deformation under load[c] (D 621), 6 hr., 2000 p.s.i., 122° F., %	6 to 8	9
Deflection temperature (D 648), 66 p.s.i. stress, °C.	79 to 83	63 to 71
Hardness[d], Rockwell (D 785)	R38	R35 to 40
Stiffness in flexure[e] (D 747), p.s.i.	72,000	88,000
Tensile yield stress[f] (D 638)		
At 73° F. (23° C.), p.s.i.	2500	3200
At 248° F. (120° C.), p.s.i	640	320
Tensile modulus[f] (D 638)		
At 73° F. (23° C.), p.s.i.	90,000 to 100,000	110,000
At 248° F. (120° C.), p.s.i.	12,500	8,500
Water absorption (D 570), %	0.03	0.03
Stress crack (D 1693), hr.	>4000	*ca.* 2000

[a]On machined bars of 0.25 by 0.5 in. section. [b]Energy absorbed as hammer passed over bar, cracking it but not breaking it. [c]Load applied to ¼ in. face of bar. [d]On disks 0.125 in. thick. [e]Specimen 0.5 by 0.5 by 0.030 in.; 0.25 in.-lb. moment. [f]On Type I tensile bars 0.125 in. thick; testing speed 0.2 in. /min.

300° C. appear valid since air was largely excluded from the melt during the test. Since the 1900 polymer was charged to the cylinder as a powder, a loose-fitting cap of silicone rubber was placed between the polymer and the steel ball so as to improve the seal when pressure was applied. At pressures of 500 to 1300 p.s.i. with the cylinder at 300° C., the material gave extrudates of slightly rough appearance. When pressures were raised to the range of 1100 to 1500 p.s.i., the nature of the extrudate changed, depending on the sample under test. There was then a sudden outrush of jagged or popcorn-like extrudate, smaller in diameter than the die, which emerged at a high rate. It looked as if a bundle of short, flexible coil springs had been compressed through the orifice and had expanded suddenly upon emerging.

Measurements of RSV on the normal-looking extrudates obtained at low flow pressures gave values close to those of the original polymer, whereas on the jagged, popcorn-like form the RSV's were about 20% of the original value. These results indicate that degradation took place during the fracturing of the extrudate. For extrudates of normal appearance at 300° C., apparent viscosities (not corrected for end effects) of 1.4×10^7 poises and 2.5×10^6 poises were calculated from measurements at shear rates of 0.2 and 2 sec.$^{-1}$, respectively, At shear rates of 3 to 10 sec.$^{-1}$, depending on the sample, the jagged, popcorn-like extrudates were observed.

These results indicate that the flow behavior of the 1900 polymer is somewhat more affected by rate of shear than is the flow of the usual commercial products, and that it must be handled at shear rates smaller by a factor of 100 or more than those used with the more familiar polyethylenes, to avoid fracturing and actual shear depolymerization during flow.

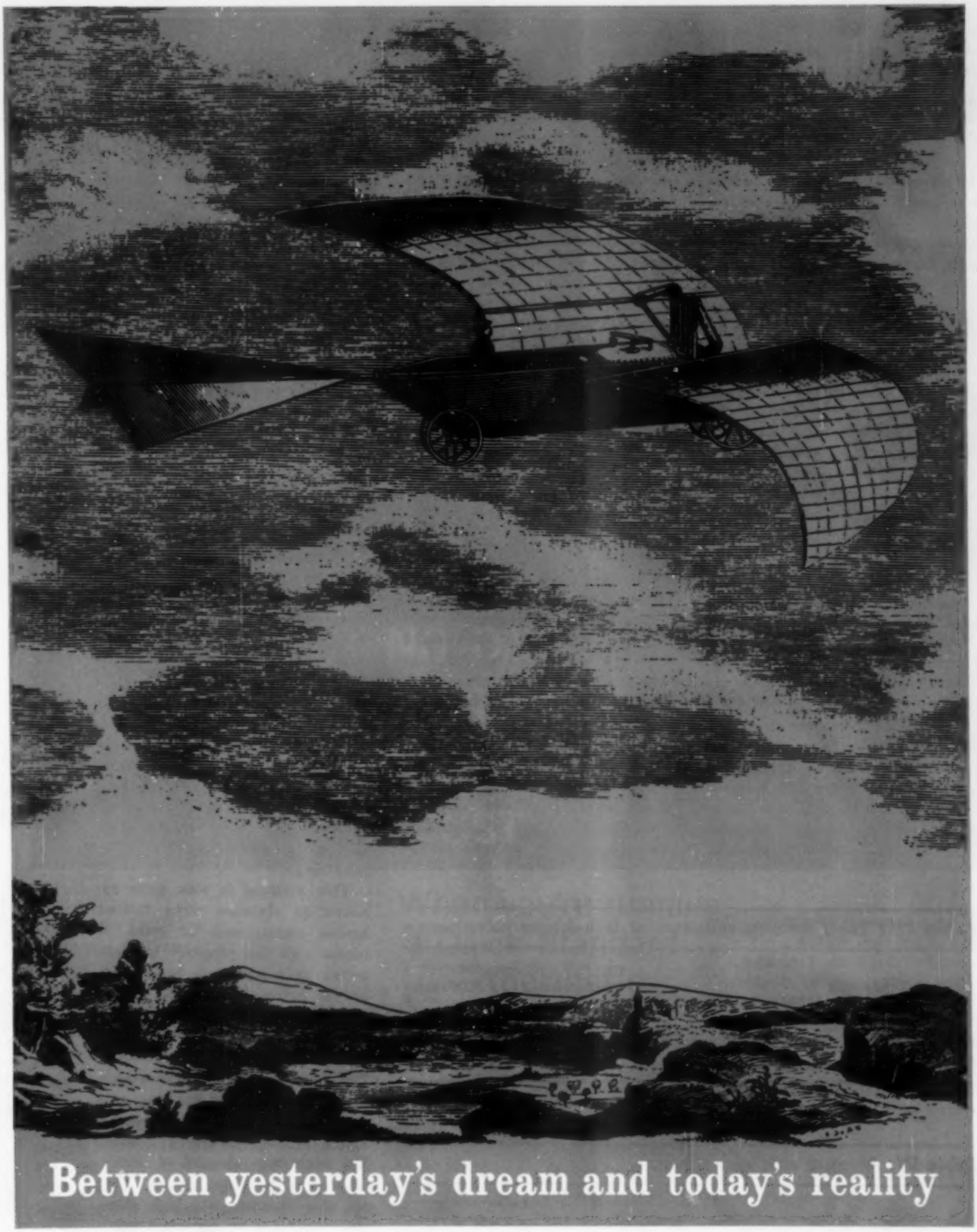
This points up the problem of molding the material. Compression molding, or flow procedures involving large flow channels over ½ in. in diameter and slow filling of cavities, are the only methods that have been found useful to date. In such flow processes, the mold walls are preferably kept hot while the cavity is being filled, and wall thickness will be 0.125 in. or more if the flow distance in such cavities is greater than about 1.5 inches.

Normal single-screw extruders usually bring about extensive shear degradation when this material is put through them; extrusion has only been successful when a double-screw extruder, with both screws rotating in the same direction, was used to push Hi-fax 1900 types through an orifice of about 0.5 in.^{2} area. Output was about 15% of the extruder capacity.

Compression molding

In Europe, the early knowledge of the toughness of material like the 1900 polymer led to efforts to compression mold it in heavy sections, and special techniques (6) were worked out for molding it into slabs 1 in. or so thick, of uniform properties and texture. In our laboratories, good compression moldings 6 by 12 by 2 in. have been made using this procedure:

A hollow chase was provided, of interior dimensions 6 by 12 by 3¾ in., with cored walls. In use, this is set in a press with cored top and bottom platens. A 6 by 12 by 0.5 in. aluminum plate is set in the cavity and topped with a polishing plate. Polymer flake is charged into the chase and compressed with an aluminum top plug 2 in. thick. The plug is removed and the cavity refilled and recompressed, until enough flake has been charged to give the desired thickness of the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molding. For a block 2 in. thick, 5.3 lb. of the 1900 polymer are charged. The charge is topped with a polishing plate and the top plug, the press closed with 300 p.s.i. pressure on the plastic, and steam at 175 p.s.i. turned into the cores of platens and chase. The heating is continued 4 to 6 hr. to melt the charge, and then cooling water is turned into the cores of the platens, and the steam shut off from the walls of the chase, but cooling water is not turned into them. It is important that the chase walls be allowed to cool no more rapidly than the plastic in the cavity, otherwise the edges of the plastic will solidify and absorb most of the pressure applied during cooling. The result of this is that the center of the block will shrink and give a block with a brittle, whitish core of high density. For a uniform block, cooling is applied from top and bottom only, the pressure being increased by 200 p.s.i. after 5 min. cooling, further increments of pressure being applied so that after about 2 to 3 hr. cooling the pressure per square inch of plastic is at least 2500 lb. and the center of the block has reached about 60° C.

Experience has shown that cooling and heating times for any thickness can only be approximated by using average heat transfer data available in published literature to solve the heat transfer equations available in handbooks or elementary texts on heat transfer. Since these average data do not take into account the phase change that takes place on melting, the predicted times are up to 50% shorter than those that give well-fused blocks of uniform density in the laboratory.

Impact strength

When slabs 0.25 in. or more in thickness were compression molded from the 1900 polymer by the technique described above, cut into test bars 2.5 by 0.5 by 0.25 in., notched and tested in a 100 in.-lb. Izod (7) tester at 73° F., the test pieces cracked and bent over but did not break completely. The hammer moved past them for varying distances. Some idea of the consistency of energy absorption by these notched sections after cracking takes place is given in Table I, p. 132.

Molded bars from a batch of 1900 polymer of RSV 28, of dimension 0.5 by 0.25 by 2.5 in., with the standard Izod notch, were conditioned at 73° F. and struck with a 100 in.-lb. Izod hammer. These pieces actually stopped the hammer and bounced it back, without being so much as cracked at the notch; their impact strength is greater than 17 ft.-lb./in. of notch.

Other data upon notched Izod impact bars of 0.25 by 0.5 in. cross section, notched and struck across the narrow face, are shown in Table II, p. 132, for Hi-fax grades 1901 or 1906 of RSV 25. Although at 73° F. these showed lower energy absorption than is shown above, in 0.5 by 0.5 in. notched section they also stop the hammer without cracking at the notch. Interestingly enough, notched Izod tests at —40° F. show that this material retains 18 ft.-lb. notched Izod strength at this temperature. This situation is consistent with reported uses of the material at low temperatures.

It is believed that these are the highest impact test values yet recorded for any thermoplastic material. The fact that impact strength is retained at full thickness of test bars is also significant. Other materials, of high impact in thin walls, lose substantial performance when in the form of ½ by ½ in. bars.

Abrasion resistance

Compression molded slabs 0.125 in. thick of the 1900 polymer were abraded in comparison with commercial high-density polyethylenes in a Taber abrader (8), provided with an H-22 wheel, and the weight loss in grams measured after 1000 and 5000 revolutions of the abrading wheel (Table III, left). No accumulation of abraded stock was found in the wheel which ran on the 1900 polymer; the low loss of this material after being abraded for 5000 cycles was thought to be caused by work-hardening.

This material is also quite resistant to abrasion when rubbed against metals such as brass. A measure of this property was obtained by mounting a brass plate on the rotary table of the Taber abrader and mounting wheels 0.5 in. wide, made of various plastics and loaded with 1 kg., on the head. The loss of weight of the wheels upon rubbing against the brass was measured after several thousand cycles of rubs (Table IV, left). The brass was cleaned of debris after every thousand cycles. This test also illustrates the high abrasion resistance of the 1900 polyethylene polymer.

Hardness

Measurements of hardness of slabs of the material give the usual values of 38-42 for Rockwell R hardness (9) of compression-

Table III: Taber abrasion resistance of high-density polyethylenes

Material	*Weight loss after* 1000 cycles	*Weight loss after* 5000 cycles
	g.	g.
Commercial HDPE (1600 Hi-fax)	0.0055	0.020
Hi-fax 1900 (RSV 28)	0.003	0.004

Table IV: Abrasive wear against brass

Material	*Weight loss after* 2000 cycles	*Weight loss after* 5000 cycles
	mg.	mg.
Hi-fax 1200 (RSV 1.8)	1.6	3.2
Hi-fax 1700 (RSV 3.8)	0.7	1.6
Hi-fax 1900 (RSV 30)	Nil	Nil[a]
Nylon (FM1001)	0.5	1.4

[a]About 1 mg. weight gain; picked up bits of brass.

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molded high-density polyethylene. Hardness was also measured on the working face of a flow-molded drop-box picker that had been used for several weeks in a multiple shuttle loom (Table V, right). Increases of density from 0.945 in the normal unstressed areas to 0.950 or more on the working faces were found, indicating an increase in the degree of order in 1900 polymer subjected to repeated impact. This, along with the increase in hardness of the working face areas, is definite evidence that the material becomes harder after being subjected to repeated impact loading, and apparently explains the increase in resistance to abrasion observed.

Table V: Hardness of working faces and other areas of picker blocks flow-molded from Hi-fax 1900

Location of measurement	*Rockwell R hardness*
Normal unstressed areas	40 to 41
Areas about ½ in. beneath working face	51 to 54
Areas on working face	62 to 64

Behavior under cyclical loading

Stress-relaxation tests made at Farbwerke Hoechst (10) indicated practically no difference in the behavior of material like the 1900 polymer and lower molecular weight commercial Ziegler polyethylenes. Typical values for dynamic modulus of elasticity and mechanical loss factor (a measure of the degree by which strain lags behind stress under repeated loadings at low stress) are presented in Table VI, below.

Since the ability of the two materials to damp out applied stresses is practically the same, the long chain length of the 1900 polymer molecule seems to be the factor that accounts for its very high impact strength, its good behavior under abrasive and work-hardening conditions, and its successful use under conditions of repeated impact where any number of other materials do not show such good performance.

To round out the picture, Table I shows properties of the 1900 polymer compared to those of a linear polyethylene of lower molecular weight. The 1900 types have the enhanced resistance to environmental stress cracking expected of such a very high molecular weight polyethylene. The high molecular weight gives a measurable improvement in values obtained by the standard tests for creep or deflection temperature. Also, a small but definite tensile yield strength remains in the material at 120° C. Hence, uses are developing for the material in a variety of load-bearing applications.

In summary then, the high resistance to repeated shock of articles made from Hi-fax 1900 results from its very high molecular weight, which also contributes to impact strengths, abrasion resistance, low flow rate under load, and the work-hardening observed with the material.

Uses

Overseas, use of material like the 1900 polymer developed first for picker blocks in looms. This piece is subjected to 60 to 150 impacts per minute as it drives the steel-tipped shuttle back and forth in the loom between the warp threads, carrying the fill yarn. Such loom parts outwear those made of rawhide or textile-reinforced rubber by ratios of up to 5:1. Most of these parts have been machined out of compression molded blocks, using fast woodworking machinery. Nearly 20 different parts for textile machinery have been made of the 1900 polymer by such techniques, including the sweep-sticks and lug straps used to drive the picker stick that drives the picker block, rollers, gears, washers, and buffer strips.

Such manufacturing methods do not fit the American pattern, and several progressive suppliers of such textile machine parts in the United States have developed flow methods for making picker blocks, lug straps, and sweep-sticks from Hi-fax 1901 or 1906, despite the problems encountered in making the material flow. The material has also been successfully incorporated into the crotch of guides for cables. In this use, despite its apparently low load-bearing properties, 1900 types have doubled the wear obtained from the cables passing over it. The key to this performance seems to be that, although the material deforms under load, it does not flow readily, hence it deforms to fit the cable contour and remains that way.

Some other interesting uses are being developed in Europe (11) from materials like the 1900 polymer. Among these are the following applications:

Gears: Tests showed that when cut steel gears were operated against machined plastic gears at 800 r.p.m. with 1500 p.s.i. load on the teeth, those made of material like the 1900 polymer ran for 2000 hr. and showed only a little abrasion. Gears machined from various polyamides or laminated phenolic broke in one-tenth to one-third this time. Such polyethylene gears are used in chemical gear pumps, and in drives and revolution counters exposed to chemical attack. Spur gears up to about 18 in. in diameter have given successful service on the wet end of paper machines. Such gears are also used in drives for continuous galvanizing equipment to reduce corrosion and pulsating effects.

Packing and gaskets: Machined out of slab stock, flange packing and rings between cylindrical sections of all-glass towers have given good service up to 70 to 120° C. in the handling of an organic acid and halogenated compounds. The impact strength, still appreciable at temperatures of **(To page 221)**

Table VI: Behavior of polyethylenes under cyclical loading

Loading time	*Dynamic modulus of elasticity*		*Mechanical loss factor*	
	At 73° F.	*At 212° F.*	*At 73° F.*	*At 212° F.*
sec.	*p.s.i.*	*p.s.i.*		
10^{-4}	276,000	29,000	0.04	0.12
10^{-2}	245,000	26,000	0.06	0.18
1	122,000	14,500	—	—
100	87,000	10,000	—	—

Glass Microballoon particles, a low-density filler

By H. E. Alford† and F. Veatch†

Glass Microballoon[1] particles are colorless; stable to about 1200° F., have a true particle density of 21.8 lb./cu. ft.; and a size range of 10 to 250 microns. In a nonreinforced polyester resin, the hollow spheres produce articles of equal strength compared with other bulk fillers on a true volume basis. However, moldings made with the new product are lighter, more rigid, and less flammable. As a bulk filler in phenolic or polyester laminates, or in polyester premixes, the spheres give 30% stronger moldings than a mineral filler at 20 to 50% weight savings. Workable viscosities can be maintained at much higher loadings using the low-density spheres. In a PVC plastisol they give much stronger moldings than a mineral filler. Artificial dielectrics can be produced with closely regulated properties over a wider dielectric constant option by combining the hollow particles with metal flake and a resin binder.

During the past several years many articles have been written on the various types of bulk fillers used in the plastics industry. All of these fillers have one drawback in common: they are all of rather high density. This article describes a low-density glass particle filler[2] that can be used successfully in a number of plastics applications. These are hollow, pinhole-free, spherical particles (Fig. 1, right). They range in size from 10 to 250 microns ($1\mu = 0.001$ mm.) and have an average particle size of 60μ. These lightweight spheres have a true particle density of 0.35 g./cc. (21.8 lb./cu. ft.). The bulk density of this material is 0.25 g./cc. (16.2 lb./cu. ft.). The particles are very resistant to water, alkali, acid, or hydrocarbon. At a 6° F. mean temperature, their thermal conductivity is 0.38 B.t.u.'s/hr./°F./sq. ft./inch. The particles start to soften at 1200° F. and melting is complete at 1400° F.

The physical properties of this material are compared with those of other fillers in Table I, p. 145. The true density of the hollow spheres is about one-third that of wood flour and only one-ninth that of the mineral filler. The mineral filler is considerably smaller than the hollow glass particles, whereas wood flour is in the same particle size range. Because fillers are used for their volume rather than their weight and because of the wide density differences between fillers, oil absorption is expressed on a filler-volume rather than a filler-weight basis. On this basis, the hollow spheres are more readily wet than is the mineral filler. From these data, it is evident that many of the properties of the ideal filler (1)[3] are fulfilled.

Use in polyester resin

Three fillers were tested in a general-purpose polyester resin (Interchemical[4] IC-312). For most of the test compositions, a 50% paste of benzoyl peroxide in tricresyl phosphate was used as the catalyst and blocks 6-in. square and 0.5-in. thick were molded at 190° F., 50 p.s.i. pressure, for a period of 20 minutes. The catalyst system that was used for the compositions containing the smallest amount of filler was methyl ethyl ketone peroxide with cobalt naphthenate as an accelerator and the blocks were cast at room temperature. Following this procedure, test specimens were then cut from the molded blocks.

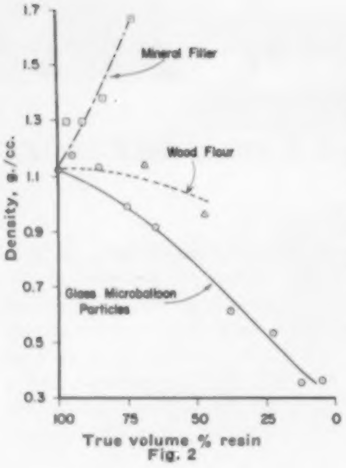
The effects of the three fillers on the density of polyester resin are shown in Fig. 2, p. 142. The mineral filler, because of its high density, increases the density of polyester resin very rapidly as the amount of filler is increased. Wood flour, because its density is very nearly that of the resin, has very little effect on the density of the polyester resin under consideration. The low-density filler, on the other hand, decreases the density of the polyester resin as its concentration is increased. The minimum density reached with this material is about 0.35 g./cc.

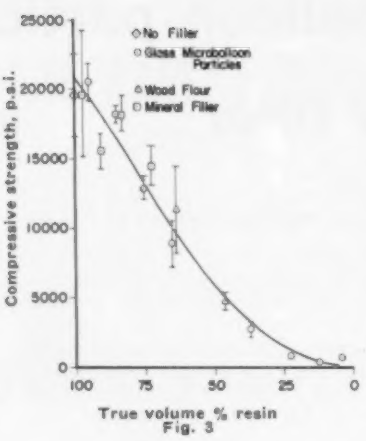
Figure 3, p. 142, shows the effects of the fillers on the compressive strength of the polyester resin under consideration. Each point is the average of at least five and in

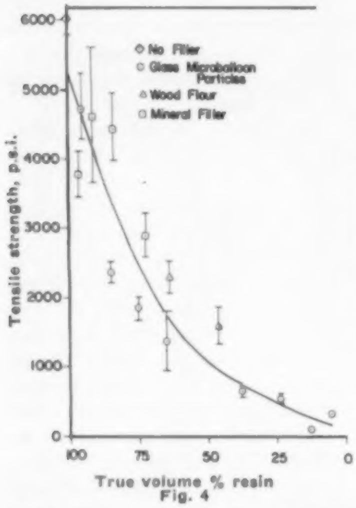
FIG. 1: Photomicrograph of glass Microballoon particles developed by The Standard Oil Co. (Ohio).

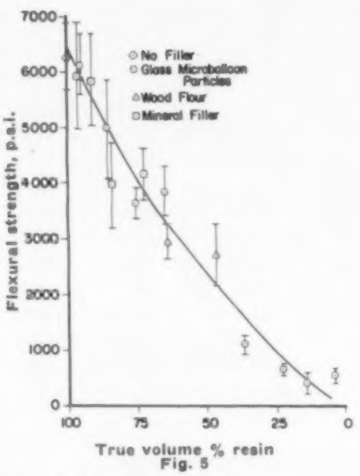
* Reg. U. S. Pat. Off.
† Research Dept., The Standard Oil Co. (Ohio)
[1] Trademark of The Standard Oil Co. (Ohio)
[2] Glass Microballoon particles, developed by The Standard Oil Co. (Ohio), are now being produced commercially by Emerson & Cuming Inc., Canton, Mass., under the name Eccospheres.

[3] Numbers in parentheses designate references at end of article, p. 223.
[4] Tradename of Interchemical Corp.
Based on a paper presented at the American Chemical Society meeting in St. Louis, Mo., April 1961.









FIGS. 2 to 5: Effects of fillers on properties of polyester resin. **Fig. 2:** Density; **Fig. 3:** Compressive strength; **Fig. 4:** Tensile strength; and **Fig. 5:** Flexural strength.

some cases 10 determinations and the deviation of the determinations about the average is shown. The curve is statistically calculated to best fit all the points. There is very little difference in the effects of the three fillers on the compressive strength of polyester resin when they are compared on a true volume basis. A similar situation exists for the effects of the fillers on tensile strength (Fig. 4, above), as well as the flexural strength (Fig. 5, above), of this polyester resin.

Thus, the hollow spheres have no advantage over conventional fillers when only strength considerations are taken into account. However, there are some advantages that do not show up in Figs. 3 to 5. The first of these is the density of the final article. At a concentration of 70 vol.-% resin, the specimen would have a compressive strength of nearly 12,000 p.s.i., a tensile strength of 2500 p.s.i., and a flexural strength of nearly 4000 p.s.i. This is independent of the type of filler used. The densities of polyester resin containing the three fillers is plotted in Fig. 6, right. The density of the mineral-filled polyester resin is about 1.65 g./cc. and the density of the wood-flour-filled polyester is about 1.1 g./cc. The density of the hollow-glass-filled polyester is about 0.9 g./cc. Therefore, the same strength characteristics can be obtained with low-density filler at a considerable reduction in weight.

The second advantage in the use of hollow glass particles as a bulk filler is the rigidity of the final article. The data from Fig. 5 have been used to calculate the relative rigidity of polyester-filler compositions containing 2 parts by weight of polyester resin and 1 part by weight of bulk filler. The resin alone was assumed to have a relative rigidity in flexure of one (Fig. 7, below). The mineral filler decreases the rigidity by about 50 percent. The low-density material, on the other hand, increases the rigidity by a factor of three. Thus, with this filler much more rigid articles can be produced at no increase in weight.

Water absorption measurements were made, using the standard 24-

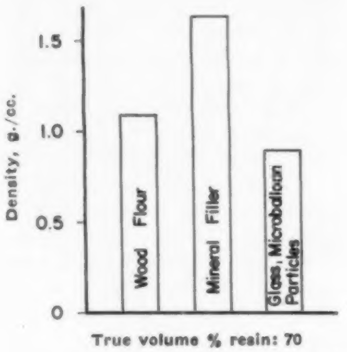


FIG. 6: Comparison of equal volume of fillers in polyester resin. Strength, p.s.i.—compressive 11,750; tensile 2,475; and flexural 3,950.

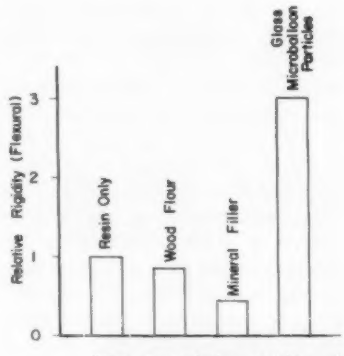


FIG. 7: Relative rigidity of filled polyester resin. Polyester: 2 parts by weight; Filler: 1 part by weight.

hr. ASTM test. The test specimens were in the form of a disk 2 in. in diameter and ⅛-in. thick, conditioned for 24 hr. at 53° C.

Weights had to be added to the test disks containing hollow glass particles, because their density was less than that of water. Because of the wide variation in density of the test pieces, water absorption is shown on a volume basis (Fig. 8, p. 146). There is no difference in water absorption for the three fillers examined. Thus, it appears that water absorption is a function of the amount of resin used rather than the type of filler employed.

The flammability measurements were made on test specimens 0.25 in. square by 6 in. long. Limits of high and low flammability, self-extinguishing, and nonflammable compositions were arbitrarily set. The self-extinguishing compositions are those that will not support flame after the flame source has been removed. Nonflammable compositions are those that will not ignite at all. Polyester resin compositions containing the hollow spheres are less flammable than those containing either of the other two fillers (Fig. 9, p. 146). In the case of wood flour this is not surprising, since wood will support combustion. The mineral filler on the other hand, being inorganic in nature, might be expected to have approximately the same flammability as the lightweight material. However, at a specific volume-% resin, the glass-sphere polyester mixture is less flammable. An explanation may be that hollow glass particles are good insulators and, consequently, will not transmit heat down the test piece. Thus, these compositions do not support combustion as readily as those containing the mineral filler.

Use with chopped glass fiber

The inert filler system in this type of compound is of utmost importance since it provides the main control of consistency, moldability, shelf life, and cure properties of the compound. Generally, premixes with low resin content can best be formulated with fillers having a spherical particle shape. The choice of fillers is complex in that a good aggregate is needed to achieve maximum loading and thereby maximum economy and optimum physical properties. Oil absorption can be used as a guide in selecting grades of fillers. Those grades that make good aggregates absorb less oil than those having a small and uniform particle size (2). From these generalities, the hollow particles should be an excellent inert filler for this type of system; they are spherical in shape, are of small particle size range, and their oil absorption is low.

The hollow glass filler was compared with a mineral filler in a ½-in. chopped glass fiber reinforced plastic. The data for the mineral filler are taken from the literature (3, 4). The resin used in this work was a diallyl phthalate type of resilient polyester resin (Interchemical IC-947). In all cases blocks approximately 6 in. square and 0.5 in. thick were molded at about 190° F., 50 p.s.i. pressure, for 15 min., using a 50% benzoyl peroxide paste in tricresyl phosphate as the catalyst. No special effort was made to fill out the mold cavity prior to the closing of the mold; consequently, the mixture would have to flow to some extent. Test specimens were cut from the blocks.

All comparisons are again made on a true volume basis. For this series of compositions, 60 volumes

Table I: Comparative properties of fillers (Reference 1)

Property	*Wood flour*	*Mineral*	*Glass Microballoon particles*
Color	Light buff	White	White
Density			
Bulk, g./cc.	0.34	1.26	0.27
True, g./cc.	1.00	2.92	0.35
Particle size range, microns	10 to 180	1 to 5	10 to 250
Oil absorption,			
g. oil/100 cc. filler		53-58	40

Table II: Properties of polyester-glass mat laminates containing hollow glass and mineral fillers

	Glass Microballoon particles	*Mineral filler*
Filler, wt.-%	2.1	25.2
Reinforcement, wt.-%	15	40
Density, g./cc.	1.44	1.82
Tensile strength, p.s.i.	14,400	15,000
Flexural strength		
Dry, p.s.i.	26,900	25,000
Wet, p.s.i.	19,700	17,500
Modulus in flexure, 10^6 p.s.i.	1.74	1.3
Water absorption, wt.-%	0.6	0.5

Table III: Properties of filled epoxy resin at equivalent volume-% loading

	Glass Microballoon filler	*Silica (200 mesh) filler*
Density, g./cc.	0.6	1.7
Flexural strength, p.s.i.	4400	4200
Linear expansion, in./in./°F.	17×10^{-6}	16×10^{-6}
Dielectric constant, 10^{10} cy./sec.	1.9	3.6
Dissipation factor, 10^{10} cy./sec.	0.015	0.028
Volume resistivity, ohm-cm.	1×10^{12}	4×10^{13}

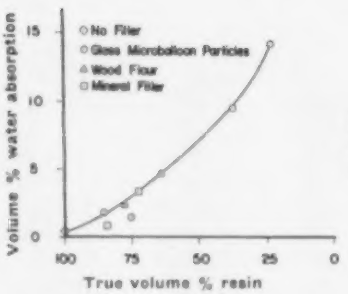


FIG. 8: Effect of three different fillers on the water absorption of polyester resin.

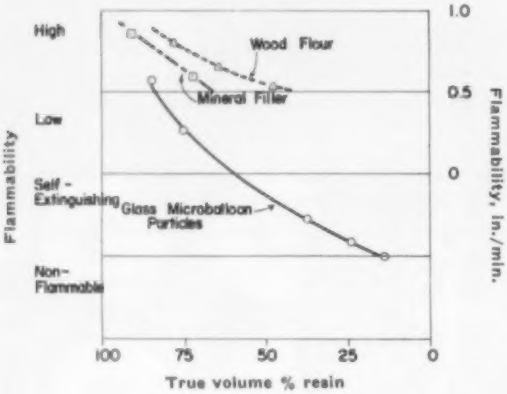


FIG. 9: Effect of fillers on the flammability of polyester resin.

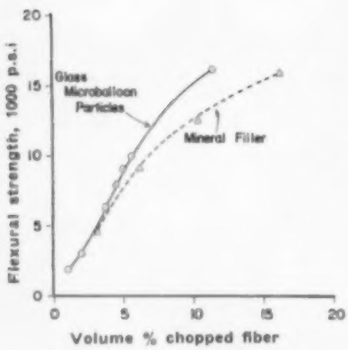


FIG. 10: Effect of fillers on flexural strength of polyester resin-chopped glass fiber compositions. 60 volumes filler; 40 volumes resin.

of the low-density spheres and 40 volumes of the polyester resin were used. Similarly, in the experiments reported in the literature, 60 volumes of the mineral filler and 40 to 50 volumes of polyester resin were used. To these was added chopped glass fiber ranging from less than 1 to about 16 vol.-percent. The effect of increasing the glass fiber concentration on flexural strength is shown in Fig. 10, above. At low concentrations of chopped glass fiber there is no difference in the flexural strength of plastic articles containing either the balloons or the mineral filler. However, at higher concentrations of chopped glass fiber, the flexural strength of polyester resin containing the lightweight product is considerably higher than that containing the mineral filler. For example, at about 12 vol.-% of chopped glass fiber, the flexural strength of polyester resin containing hollow glass particles is approximately 16,000 p.s.i., whereas with the mineral filler it is of the order of 13,000 p.s.i.

The advantages in the use of this new material in chopped glass fiber reinforced plastics are obvious. Using a constant amount of chopped glass fiber it is possible to obtain considerably higher strength articles with the hollow particles than it is with a mineral compound as the bulk filler. On the other hand, if it is desired to produce articles of equal strength, a considerably higher volume of chopped glass fiber is required if the mineral filler is used as the bulk filler material.

The differences between these two bulk fillers are even more noticeable if the flexural strength to weight ratios of the two are considered (Fig. 11, p. 150). The compositions containing hollow glass particles have about twice the strength-weight ratio of those containing the mineral filler. For many applications, particularly those in the aircraft industry, the strength-weight ratio is much more important than is the strength alone.

Use in polyester glass-mat laminates

Interchemical IC-312 general-purpose polyester and 1-oz. glass-mat reinforcement were used. The catalyst system was methyl ethyl ketone peroxide with cobalt naphthenate as the accelerator. The molding pressure for the specimens was 50 p.s.i.; temperature, room-@72°F.; molding time, 10 minutes. All of the specimens were post-cured for 1 hr. at 250° F.

The new filler is compared with a mineral filler in this type of application (Table II, p. 145). Using the hollow spheres, only 2.1 wt.-% was used as a bulk filler, as compared with 25.2 wt.-% of the mineral filler. On a volume basis, these are nearly equivalent. Also, with the low-density filler, only 15 wt.-% of glass mat reinforcement was used compared with 40 wt.-% glass mat reinforcement with the mineral filler. The density of the balloon-containing material is 26% lower than that of the material containing the mineral filler. The tensile strength of the two are essentially equivalent as are the flexural strengths. The modulus of elasticity in flexure of the material containing the balloons was 30% higher than that of the material containing the mineral filler. The wet strength retention in flexure of the hollow-glass-filled material is also considerably higher than that of the mineral-filled material. Thus, although the compositions are considerably different, hollow glass particles will produce a glass mat laminate of equal or superior properties to that obtained with the mineral filler.

Use in phenolic laminates

Bulk fillers were also compared in a phenolic glass-mat laminate (Fig. 12, p. 150). The compositions containing the hollow-sphere filler were cured at 50 p.s.i. and 220° F. for 15 min. and postcured for 2 hr. at 250° F. The data for china clay filler are **(To page 150)**

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Pro-fax bag keeps lettuce fresh longer

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As a film in cast or oriented form, Hercules Pro-fax polypropylene yields more crystal-clear packaging per pound than any other plastic. Low-cost Pro-fax packaging wraps are available for all kinds of dry and moist products. With excellent resistance to creasing and abrasion, they are heat-sealable and cementable. High resistance to fatty foods and safe sterilization at temperatures to 275°F invite broad application potentials. Most important of all, Pro-fax is FDA approved.

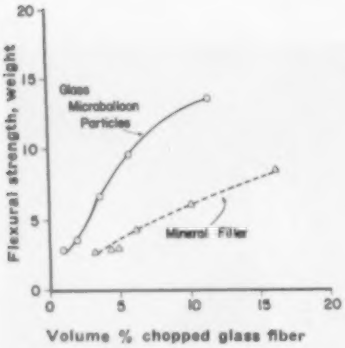


FIG. 11: Strength:weight ratio of filled polyester resin-chopped glass fiber compositions. 60 volumes filler; 40 volumes resin.

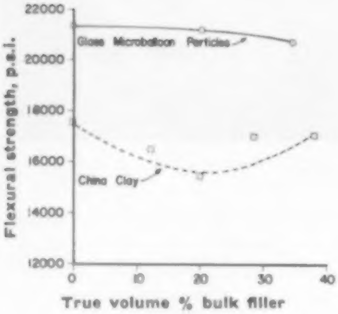


FIG. 12: Effect of bulk fillers on the flexural strength of phenolic laminates (15 to 22 vol.-% glass mat for china clay and 22 to 15 for glass balloon compositions.

taken from the literature (5). The two contain similar amounts of glass-mat reinforcement. The bulk fillers are compared on a true volume-% basis, and over the concentration range studied, the flexural strengths of the compositions containing the lightweight material are about 20% higher than those of the compositions containing china clay. Even considering possible differences in fabrication, this improvement is significant.

Use with epoxy resin

Test compositions made with Epon[5] 828 and 10 p.h.r. of diethylenetriamine as the curing agent were molded in 6-by-6-in. blocks about 0.5-in. thick, for 10 min. at 50 p.s.i., followed by standing at room temperature for several hours. Results using the product as a bulk filler are compared with those for a porous volcanic rock filler (6) in Fig. 13, right. There is apparently little difference in the compressive strengths of the filled epoxy resins. There are two advantages to the use of the balloons. The first of these is the surface finish of the epoxy resin. The volcanic rock used has a particle size of ¼ to ½ in. diameter. Therefore, with its use, considerable surface irregularities occur in the epoxy resin. Because of the much smaller particle size of the glass balloon particles, a relatively smooth surface is obtained. A second advantage is in the weight of plastic articles produced using these two fillers as a bulk filler. Using 10% resin, for example, the material containing the volcanic rock will have a density of about 0.63 g./cc. Using the same amount of resin with the hollow glass beads as the bulk filler, the material will have a density of about 0.44 g./cc. If these materials were to be used in plastic tooling, for example, the considerable weight savings from the use of this new material would make for much easier handling. Thus, for the same strength characteristics, hollow glass particles would give a finished article that would weigh about one-third less than the same material fabricated with porous volcanic rock.

Use in PVC plastisol

Test compositions formulated with PC-11 Heat-Fusible Rack Coating[6] were cast in the form of blocks approximately 6 in. square and 0.5 in. thick, which were cured for 1 hr. at 350° F. Test specimens were cut from the blocks. Using the low-density material as a bulk filler, it was possible to go to at least 50 vol.-% filler and still maintain viscosity such that the mixture could be cast, whereas the maximum amount of mineral filler that could be used was about 25 vol.-percent. At the 25 vol.-% mineral filler level, tensile strength was about 200 p.s.i.; a similar composition containing the light weight balloons gave a tensile strength of about twice that or nearly 400 p.s.i. (Fig. 14, right). In addition to the improved strength characteristics of the vinyl plastisol using these particles as a bulk filler, there is a wide difference in density of the final article. For example, at the 25 vol.-% glass-sphere level, a density of 0.94 g./cc. is obtained. Using the mineral filler at the same concentration, the density is 1.40 g./cc. Thus we have reduced the density by more than 30% and increased the strength by a factor of two if the hollow spheres are used in the place of the mineral filler. In addition to these differences, it is much easier to mix this new product with the vinyl plastisol than it is with the mineral filler.

Artificial dielectrics

Fifty parts by weight of the hollow spheres added to 100 parts of a liquid epoxy resin yields a casting compound that is pourable and easy to use. The cured casting has a density of 0.6 g./cc., yet has strength properties comparable to those of filled epoxy compounds of three times the weight (Table III, p. 145). The dielectric constant and dissipation fac- **(To page 223)**

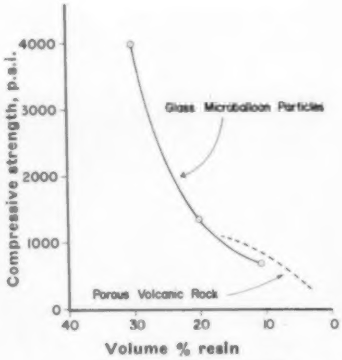


FIG. 13: Effect of fillers on compressive strength of epoxy resin compositions.

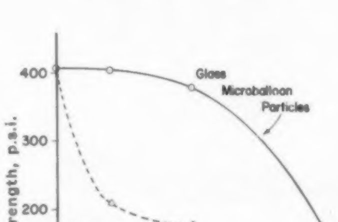


FIG. 14: Effect of fillers on tensile strength of polyvinyl chloride plastisol.

[5] Tradename of Shell Chemical Co.

[6] Produced by Munray Products Inc.

Urethane foams from methyl glucoside polyethers

By T. E. Yeates* and C. L. Mehltretter†

The crystalline acetal, methyl glucoside, readily derived from corn starch by methanolysis, has the physical properties and chemical structure suitable for conversion to polyethers. Urethane foams of possible utility may be prepared from polyethers of methyl glucoside and diisocyanate. Melted methyl glucoside has been reacted with ethylene oxide to yield a variety of polyoxyethylene derivatives, which were crosslinked and expanded with toluene diisocyanate to produce rigid, semirigid, and flexible foams.

Methyl glucoside,[1] derived from corn starch, is commercially available in a price range competitive with other industrial polyols. The product is a stable mixed acetal of glucose and methyl alcohol containing four hydroxyl groups within its structure. These groups are capable of polyetherification with ethylene oxide or propylene oxide to yield appropriate derivatives for subsequent crosslinking with diisocyanates to form urethane foams.

Initial investigation of urethane foam production has given products of high density. Application of the many techniques now available in this field should permit the preparation of lower density foams from methyl glucoside polyethers crosslinked with diisocyanates.

This article describes preliminary work on the preparation of polyethers of various viscosities, molecular weights, and hydroxyl numbers by reaction of ethylene oxide with methyl glucoside. The polyoxyethylene methyl glucosides so obtained were crosslinked with toluene diisocyanate to produce rigid, semirigid, and flexible foams.

Preparation of polyoxyethylene methyl glucosides

The first addition of ethylene oxide to methyl glucoside probably occurs predominantly through reaction of the primary alcohol group of the acetal to give the hydroxyethyl ether as shown below.

Further reaction is achieved by introducing more ethylene oxide gas into the melted methyl glucoside (167° C.) containing 0.5% of sodium methoxide catalyst whereby the secondary alcohol groups are hydroxyethylated and the chain lengths of the alcohol ethers are extended. The degree of polyetherification is readily determined by the gain in weight of the reacted methyl gulcoside and is expressed as the mol ratio of ethylene oxide to glucoside.

Four polyoxyethylated methyl glucosides (see the table below), were prepared using 6, 17, 33, and 63 mols of ethylene oxide per mol of methyl glucoside. In general, the polyethers were brown sirupy liquids which could be decolorized to pale yellow by treatment with activated carbon. Brookfield viscosity at 25° C. decreased with an increase in ethylene oxide content up to the final polyether, which is a low melting solid, but the range was quite satisfactory for handling in foam production.

Preparation of urethane foams

Like other polyethers used in urethane foam production, polyoxyethylene methyl (To page 225)

Properties of polyoxyethylene methyl glucosides

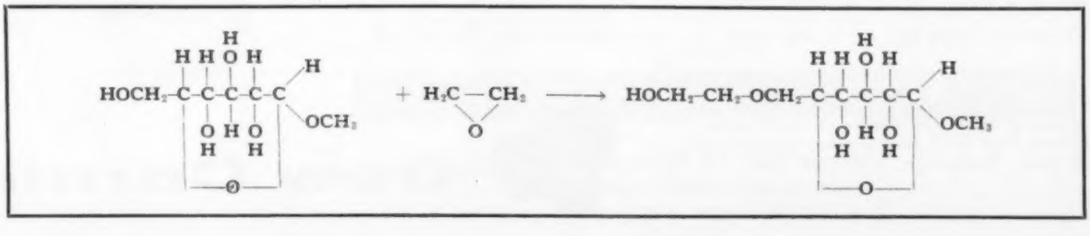
Properties	Mol ratio of ethylene oxide:glucoside *6*	*17*	*33*	*63*
Hydroxyl no.	480	243	137	76
Molecular wt. (calcd.)	468	923	1,640	2,960
Viscosity at 25°C., cp.	16,450	950	730	295[a]
Moisture, %	0.09	0.02	0.07	0.3
Ash, %	0.07	0.04	0.06	0.06

[a] Viscosity at 50°C.

*Chemist, Starch Products Investigations.

†Head, Starch Products Investigations, Northern Regional Research Laboratory, Peoria, Ill., a laboratory of the Northern Utilization Research and Development Div., Agricultural Research Service, U. S. Dept. of Agriculture.

[1] G. N. Bollenback, "Methyl Glucoside," Academic Press Inc., New York, 1958.



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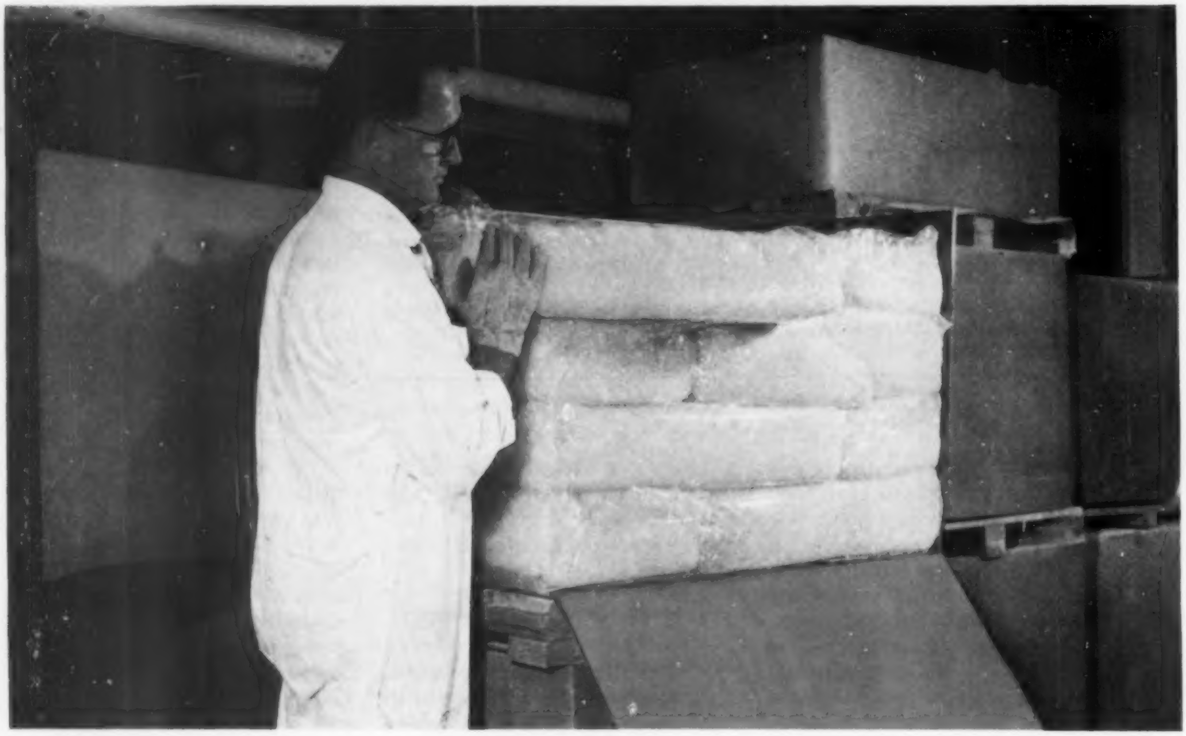

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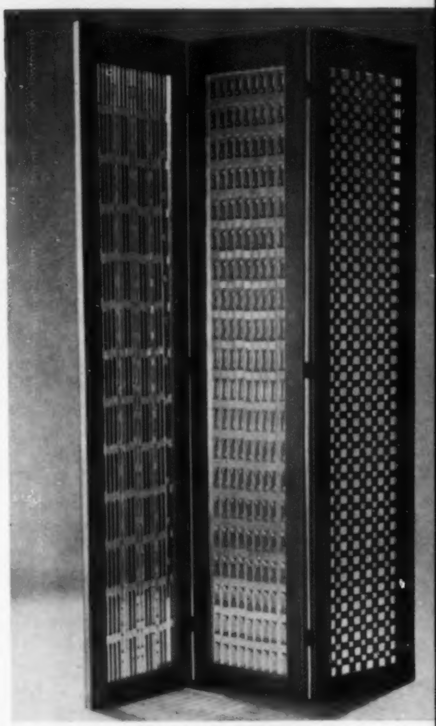
NEW DEVELOPMENTS

Many minds at work on new ways to use plastics, new designs, and new product concepts offer ideas you can use.

FROM THIS—extruded vinyl tubing with "pockets" of gas or liquid—interior decorators now can go . . .



. . . **TO THIS:** three-dimensional furniture and room-divider webbings with sparkling, colorful translucent effects.

Filled webbing—new tool for decorators

Extruded vinyl tubing, heat-sealed at predetermined intervals, and with the resultant "pockets" filled with gas or liquid, bids fair to become a novel design element in outdoor furniture, interior partitions, and other applications calling for webbed structures. The material is produced by Enko Creations Inc., New York, under the designation Aerobubble Chain.

Vinyl hose used in this process is generally of ½-in. O.D., and is commonly known as furniture tubing (other-diameter tubing is also feasible). The heat-seals themselves measure about ⅞ inch. Their spacing can be almost infinitely varied, so that it is possible to develop all sorts of bubbles of different size and pattern. At the time of sealing, the tube is filled with compressed air, or, in the case of clear tubing, with colored liquids to produce highly decorative effects. Details involved in this filling process are not available for publication.

First application of the bubble-webbing is in outdoor furniture, where it competes on a price basis with standard vinyl furniture tubing. Actually, the per-foot cost of the new material is double that of the standard tubing; however, the latter is applied around the front and back of the aluminum frame, while the new tubing is only applied to one side. Thus, on an installed basis, they're about the same. An advantage claimed for the Aerobubble webbing is the fact that the heat seals mate to form a basket-weave pattern, producing a minimum of sliding and shifting around.

Liquid-filled bubbles are finding application as decorative room dividers.

Other applications of the new tubing include flotation, marine barrier markings, curtains, specialized textile fabrics (with the new tubing part of the weave) and materials handling equipment.

Printed PE tarps protect flat-car shipments

Polyethylene film tarpaulins—untreated but imprinted with promotional copy—are providing a colorful and economical means of protecting large, open, flat-bed shipments of a variety of products from the effects of weather. This new industrial application for PE film and sheeting permits shippers of gypsum wallboard, lumber, metal products, and other items to take advantage of the ease of maneuverability and rapid loading and unloading which flat-bed shipping affords. At the same time, cargo can be effectively shielded from dirt, dust, water, contaminants and vagaries of the weather. Printed with the shipper's trademark and name in giant-sized letters, the tarps also serve as a traveling display.

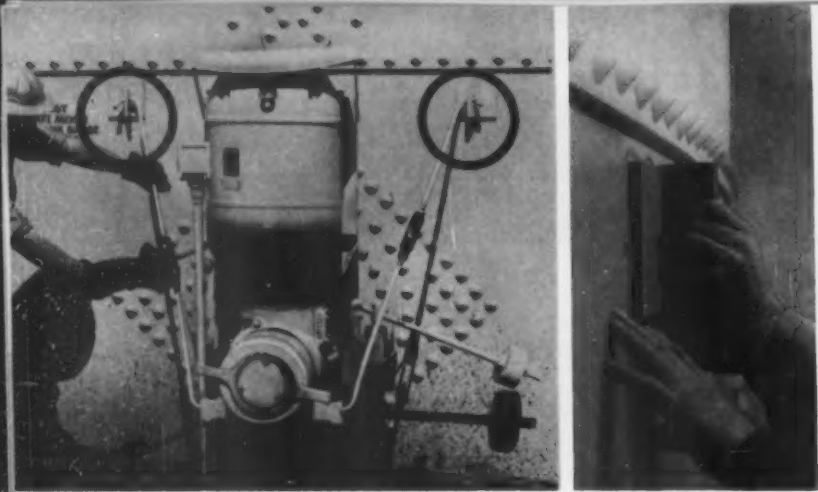
In one application, gypsum wallboard is shipped (see photo) by flat car from the West Coast by Fiberboard Paper Products, covered with yellow PE sheeting imprinted in red.

The printed tarps can be ordered in widths of from 16 to 24 ft. and in continuous lengths as required. Gages of from 1 to 15 mils are available.

The legend, in dimensions up to 21 in. wide and 30 in. long, is printed in-line as the blown sheeting is extruded and can be repeated every 3 ft. or in multiples thereof. Dual legends appear on opposite sides of the centerface slit. Legends are printed in ink in a single color on natural, white, black, or pigmented PE.

The tarps are extruded and printed to specifications by Gering Plastics, Div. of Studebaker - Packard Corp., Kenilworth, N. J.

(More Developments on p. 156)



STEEL PLATES (circled) bonded to oil tank with epoxy and simple hand pressure (right) anchor support rods for heavy mixer motor. Bonding set in less than 24 hr., saved at least 6 days down-time.

Epoxy resin bonding replaces welding

Use of an epoxy-based adhesive to join steel support plates to a large steel tank not only solved a difficult bonding problem but may also herald increased applications of resin bonding in the field of structural joining.

The problem: how to attach a mixer to a 5-million-gal. crude oil tank without appreciable downtime or expense, and at complete safety to workmen. Support plates for the mixer could have been welded to the tank, but only after it had been drained, purged, and cleaned to eliminate an explosive atmosphere. This would have entailed at least 6 days of downtime at a cost of about $2,500. Another method, filling the tank with water or high-flash-point oil prior to welding, also involved delay.

Epoxy adhesive bonding of the components permitted the tank to be restored to normal service in less than a day. When the level in the tank was low enough, a manhole cover on the side of tank was removed, and the mixer installed outside this opening cover and temporarily supported from the ground. Surfaces of the support plates and tank were then sandblasted, and the bonding agent, a mixture of adhesive paste and liquid hardener, was spread by putty knife to a 1/16-in. layer on both plates and tank. The plates were pressed against the tank and supported with jury-rigged blocks until the bond had set overnight.

The adhesive used was solvent-free Epon Adhesive 901/B-1, a product of Shell Chemical Co., Adhesives Dept., Pittsburg, Calif. It is said to bond steel to steel with a tensile strength of 2,800 p.s.i., and to be resistant to moisture, sunlight, climatic changes, and most organic liquids. The steel plates, bonded to the oil tank over 6 months ago, are still supporting a continual load of 1,250 pounds.

Foam core-concrete skin sandwich

In pursuit of its polygamous adventures, a plastic has now teamed up with concrete to make a unique exterior wall structure: a sandwich consisting of outer skins of 1¾-in.-thick concrete slab with a 1½-in.-thick core of molded polystyrene foam of 1-lb./cu.-ft. density. These panels have been used in tilt-up wall construction at United Control Corp.'s new 136,000-sq.-ft. manufacturing facilities at Bellevue, Wash.

Advantages claimed for this wall design are 1) prevention of water vapor transmission and 2) high thermal insulation which, according to the manufacturer, is expected to bring about substantial savings in heating and air-conditioning costs.

The tilt-up panels were produced at the site in 9- by 12- and 22- by 12-ft. dimensions. After the factory floor was built, wooden forms for the wall panels were laid flat upon it and the concrete for one face of the panel poured. While this was still soft, the sheets of PS foam were positioned on it in order to obtain adhesion. The other concrete skin was then poured atop the foam insulation. (The concrete is steel-reinforced.) The insulation board is kept several inches shorter in length and width than the concrete faces so that the concrete comes together at the edges to seal the insulation completely. Panels were grouted in at the floor line.

A total of 85 of these plastic-concrete sandwich panels was used for the structure.

Insulation board, tradenamed K-Thermo, is manufactured by Kirkland Industries Inc., Kirkland, Wash., from expandable polystyrene supplied by Koppers Co. Inc.

Impact polystyrene for hair dryer

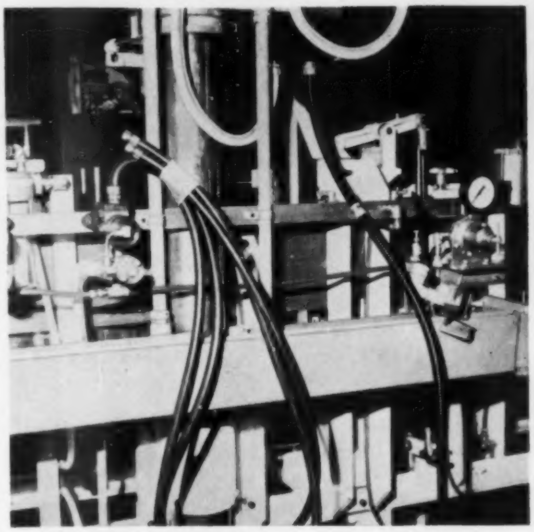
A molded plastic hair dryer attachment utilizing the heated air produced by household clothes dryers was recently placed on the market by Norge Div., Borg-Warner Corp. The unit may be quickly and easily attached to any Norge automatic dryer.

The hemispherical hood of the dryer is made in two assembled parts—an outer shell and a smaller inner shell having a number of cored openings through which warm air is directed to the hair. The hood is large enough to fit easily over pin curls and rollers. Its double-walled plastic shell is injection molded of high-impact styrene, selected for its resistance to breakage and ability to withstand the heat given off by the dryer. Even if accidentally dropped onto a hard floor surface, the hood is not likely to be dented or damaged.

Components for the hair dryer accessory are molded by Perry Plastics Inc., 3409 W. 14th St., Erie, Pa.

HAIR-DRYER ATTACHMENT for laundry dryers permits housewife to get "professional" drying or setting after home permanent in her own kitchen.

Savings through switch from copper to PE tubing



PE TUBING on packaging machinery not only provides long-term performance superior to copper tubing, but can also be easily color-coded.

Among the major changes made by Bartelt Engineering Co., Rockford, Ill., in the redesign of the mechanical and electrical systems of the packaging machines it produces, was a switch from copper to polyethylene tubing in the pneumatic control lines. Reason for the change involves both price and properties.

Formerly, the company used ⅜- and ½-in. copper tubing supplied in 50-ft. rolls. Prices for these were 16.4 and 21¢/ft., respectively. PE tubing of the same diameters cost 5½ and 8¾¢/ft., respectively, and come in lengths of 250 and 500 feet. Because polyethylene tubing can be rolled more compactly, these greater lengths take up considerably less storage space than do the short lengths of copper tubing that was used.

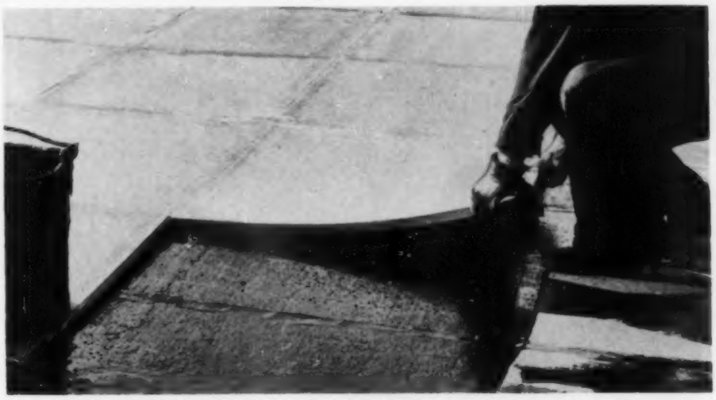
While the PE tubing itself is lower-cost, the fittings are slightly higher than copper counterparts. However, this higher cost is absorbed by the fact that, with PE tubing, there is no need for cutting, mechanical bending, flaring, or the use of tools to tighten fittings.

In terms of service life, PE also has the advantage. While the new system has not been installed long enough to make available data based on long-term performance, some conclusions can be drawn from experience to date: Copper, according to the company, is easily and irreparably crushed. PE tubing, on the other hand, springs back to its original shape. PE tubing is vibration-proof on Bartelt equipment, while copper tubing is not. Copper sometimes cracks at the flared end, which PE does not, according to the company.

The PE tubing is said to perform as satisfactorily as copper. Moreover, it has the big advantage of built-in color coding. In this case, white is used for vacuum, while red denotes the air pressure.

The high-density PE tubing is extruded by Imperial-Eastman Corp., Chicago.

Urethane roofing board



PANELS with rigid urethane cores sandwiched in skins of mica-surfaced, asphalt-impregnated felt offer superior roofing insulation at lower cost. Among other advantages: the pre-fabricated panels can be applied directly to roof surface with hot roofing bitumen, can be worked on and walked on immediately.

Reportedly twice as efficient as any other insulation for flat built-up roofs, sandwich panels with rigid urethane foam cores introduced by Allied Chemical's Barrett Div. now make available a building material especially suited for applications where insulation requirements are critical: electrically heated, air conditioned, and cold storage buildings.

Here's how the insulation of the new board compares with other types (all 1-in. insulation).

New urethane board	0.13
Glass fiber	0.27
Polystyrene	0.30
Perlite	0.34
Fiberboard	0.36
Cellular glass	0.40

These figures measure the conductivities of the various materials (C value =B.t.u./hr./sq.ft./°F.). The lower the number, the better the insulation.

The foam core is hydrofluorocarbon-blown rigid urethane of approximately 2-lb./cu.-ft. density. The skins of the panels, each 0.05 in. thick, consist of mica-surfaced, asphalt-impregnated roofing felt. The sandwich is produced by lamination and is supplied in 3- by 4-ft. panels in thicknesses of 0.8 to 2 inches. (The C value of the 2-in. panel is a low 0.07.)

Cost, in the 1-in. thickness is $215/1000 sq. feet. This is about the same as the cost of 2½-in. fiberboard insulation, and has about the same insulation value. However, several advantages are claimed: 1) lighter weight makes the new panels easier to handle; 2) wood nailers can be thinner, gravel stops smaller, and curbs lower; 3) lower weight means savings because structural requirements of roof-supporting members are less severe (weight is only ¼ that of fiberboard); 4) since panels are factory laminated, they provide an immediate work-on, walk-on surface; 5) sandwich panels can be applied directly in the hot roofing bitumen.

Isocyanates for foam supplied by National Aniline Div. of Allied Chemical Co., polyether by its Solvay Process Div., and Genetron blowing agent by the General Chemical Div.

(More Developments on p. 161)

"By selecting from the most complete styrene line we slashed shipping breakage 95% ...cut start-up time 50%"

"Only Monsanto was able to supply the two styrene materials we needed for both overseas and domestic use," reports Mr. Robert B. Thomson, Purchasing Agent at Jet Spray Cooler, Inc., Waltham, Massachusetts. "For domestic requirements, we switched to *Lustrex* for the side panel on our cooler, cutting start-up time 50% and getting the right level of performance with economical cost. For overseas use, we switched to *Lustran*, cutting shipping breakage to less than 1%. Both Lustran and Lustrex work smoothly and completely in the same mold. Components, with dimension and color perfectly matched, are used interchangeably.

Can the broadest line of styrene materials with the widest range of mechanical properties provide a closer match to the price/performance requirements of your applications? By selecting from the only complete line of general purpose, medium impact, high impact, super high impact, SAN or SAB materials you don't have to over-buy or under-engineer. You get the impartial material recommendations that only a supplier with a full line can offer. In addition, you can make savings by combining shipments.

Ask your Monsanto representative to show you how the Lustrex-Lustran line of styrene materials can help you engineer better products at lower costs.

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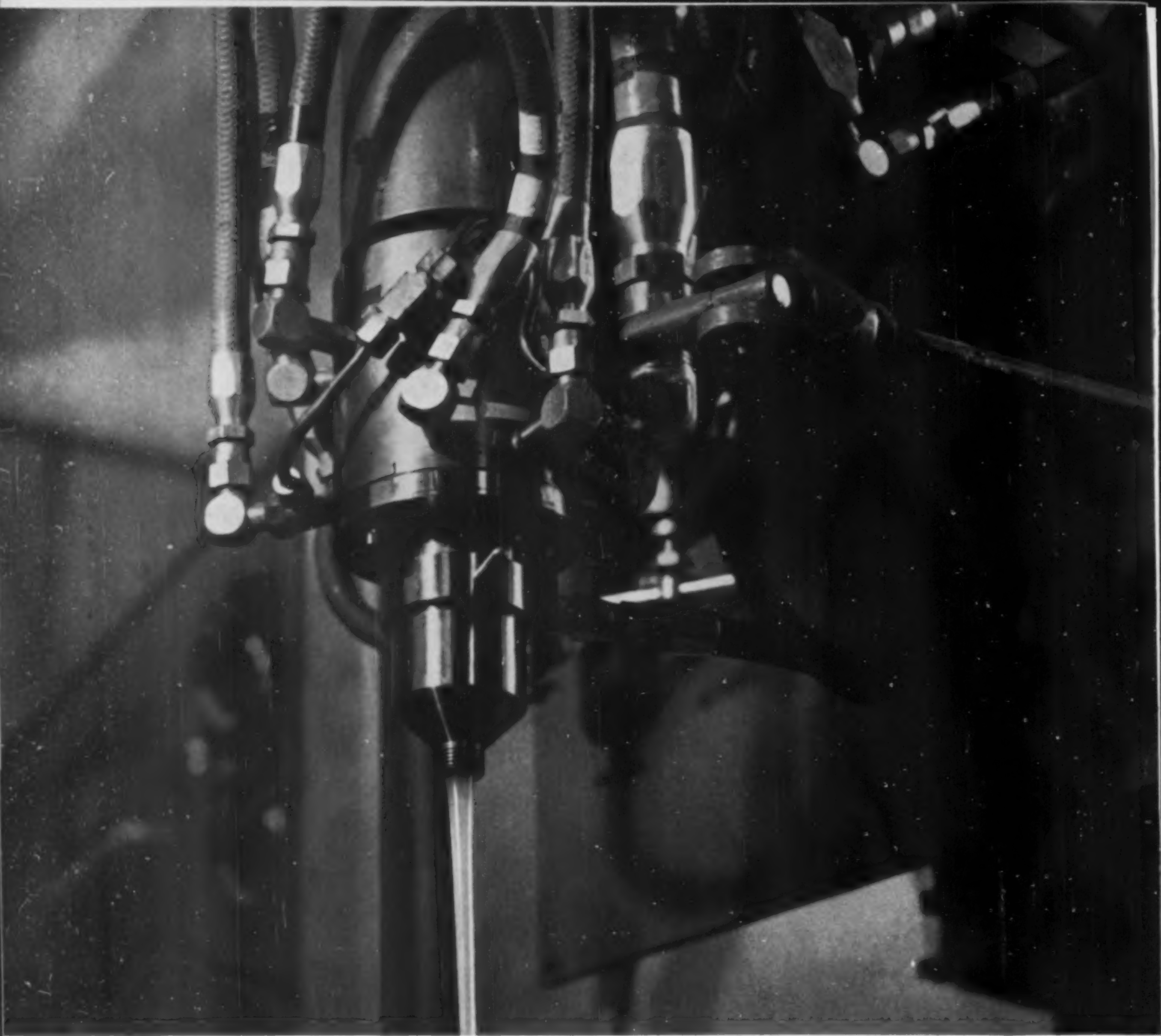


ABS sheet for portable scooter

The high impact resistance, flexibility, and light weight of ABS (acrylonitrile-butadiene-styrene) sheet led to its selection as the material for the body, fender, and deck of the new Centaur motor scooter, a full-sized two-passenger vehicle which can fold to the size of a suitcase.

Five ABS parts are involved: two side panels, tailpiece, fender, and deck. They are vacuum formed of 0.093-in. self-extinguishing sheet, and they contribute only a few pounds to the unit's total weight of 95 pounds. Formed into the parts are recesses to accommodate license plate, tail and brake lights, and decorative decals. Parts are attached to the scooter's welded steel-tubing frame with ¼-in. turn-spring lock fasteners.

The embossed surface of the integrally colored sheet reduces the effects of scuffing, while the material's flexibility enables it to resist denting when struck.

Retail price of the Centaur is $365. Charles Butler Associates designed the Centaur for American Motor Scooter Corp. Walter Speck Plastics, Nazareth, Pa., formed the plastic components, utilizing a 35 x 48 Air-O-Flow press. Material is ABS sheet, 6500 series, by Bolta Products Div., General Tire & Rubber Co.

Three new blow molded applications

1 Balsa wood floats, used to support safety lines along ocean beaches for many years, may soon be replaced by urethane-foam-filled blown polyethylene markers.

In trials at Miami Beach, Fla., the PE floats have been unaffected by salt water and marine growth for over a period of 8 months, which is claimed to be the equivalent of five seasons up North. More important, initial purchase price of the new floats is lower than even reconditioned balsa equivalents. In addition, the tests are reported to have indicated that the blow-molded unit has better impact and wear resistance and improved buoyancy. The shape of the new float is essentially the same as the older counterpart, so that standard rope and rope sling attachments can be used.

The units are blow molded of orange-pigmented high-density PE by Air Formed Products Corp., Nashua, N. H., using Celanese resin. Foam-filling by Strux Div., Aircraft Specialties Co., Inc., Hicksville, N.Y., which also markets the float. Freon-blown polyether of 2-lb./cu.-ft. density, supplied by General Latex & Chemical is used, with 1½ lb. going into each float.

2 Taking a leaf from the experience of the fountain pen industry, Smith-Corona Marchant has now incorporated a disposable cartridge, blow molded of high-density polyethylene, in its Vivicopy 12, an automatic photocopying machine. Developer fluid is now delivered to the user of the machine in the 58-oz. PE container, which is inserted in the back of the machine. Fluid is automatically discharged into the developing tray and, at the end of the copying cycle, automatically returned to the container, eliminating loss and deterioration due to exposure to the atmosphere, and also doing away with messy pouring, spilling, and mixing. When new developer is needed, the old cartridge is discarded and a new one inserted.

The containers are blow molded by Dewitt Plastics, Auburn, N. Y., from Celanese Polymer Co. PE.

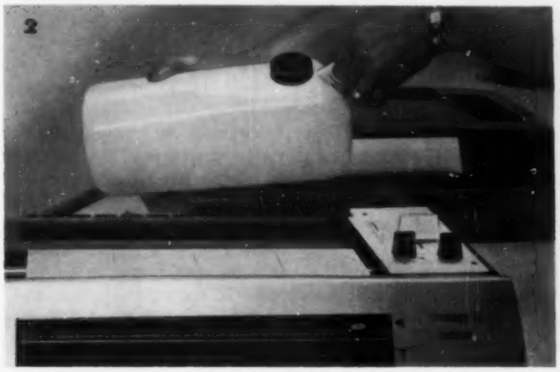
3 Following the introduction of ½- and 1-gal. jugs for consumer use, Owens Plastics Co., Kansas City 25, Mo., has now introduced a 5-gal. jug-shaped container for industrial applications. The handle is recessed to permit form-fitting overpacks, and is large enough for much of the handling necessary in commercial use.

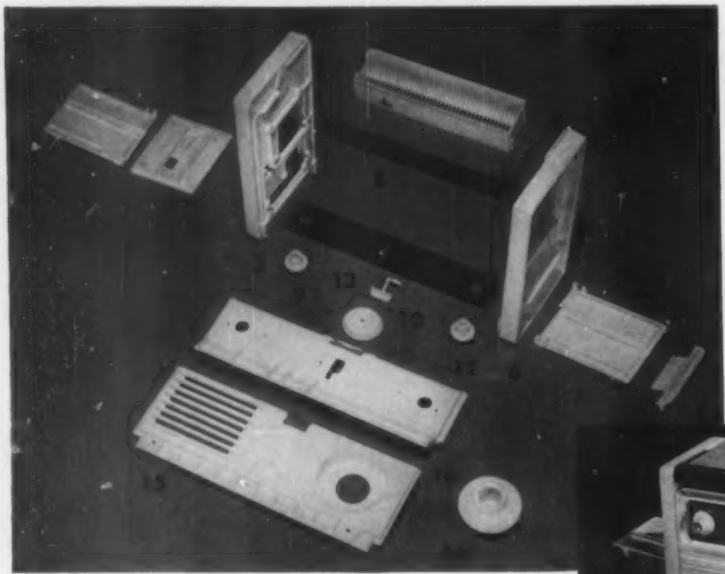
Outside dimensions are 11-in. diameter, 19¾-in. height, weight 3¼ lb., inside neck diameter 83 mm., and overflow capacity 5.25 gallons.

The bottles are made in both conventional and high-density PE. The company says the conventional PE jug has ICC approval for use with overpack, and that the high-density containers can be used without it.

A 2-lb. jug in high-density material is also available.

(More Developments on p. 162)





EXPLODED VIEW of portable slide projector parts shows 1) rear folding panel, 2) receptacle panel, 3) rear end panel, 4) slide tray, 5) combination handle and tray advance bar, 6) front end panel, 7) front folding panel, 8) elevator bar, 9) control knob, 10) editing lever, 11) tray advance and reverse knob, 12) control knob, 13, 14, 15) side control panel parts, and 16) manual operating dial. Control knobs, dial, and editing lever are molded of cellulose propionate; slide tray is of polystyrene; all other components shown are molded of urea.

Urea houses slide projector

The glamor surrounding some of the newer plastics cannot altogether obscure the fact that the old standbys still offer many property advantages that make them the chosen material in a whole range of applications. A case in point is the choice of urea for the housing of a new portable slide projector being offered by Sears, Roebuck.

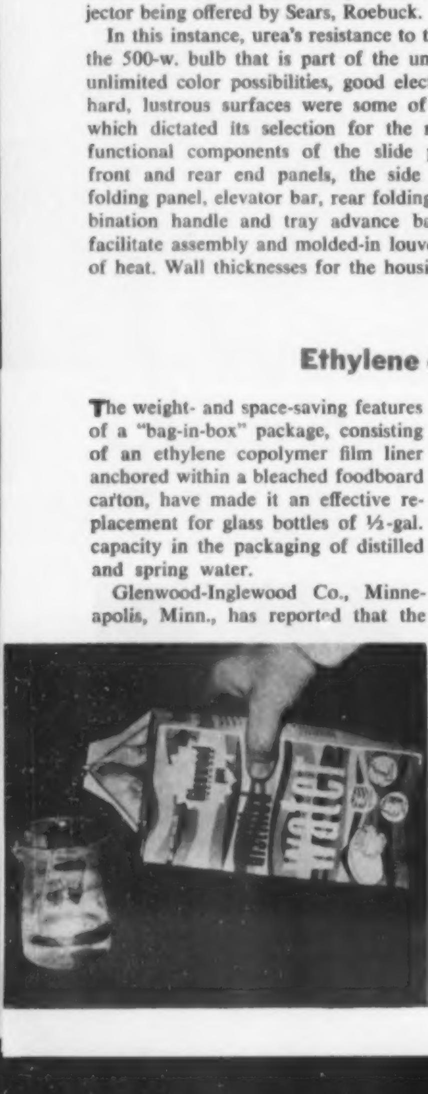
In this instance, urea's resistance to the heat generated by the 500-w. bulb that is part of the unit and the material's unlimited color possibilities, good electrical properties, and hard, lustrous surfaces were some of the special features which dictated its selection for the major structural and functional components of the slide projector's case: the front and rear end panels, the side control panel, front folding panel, elevator bar, rear folding panel, and the combination handle and tray advance bar. Molded-in bosses facilitate assembly and molded-in louvers permit dissipation of heat. Wall thicknesses for the housing range from 3/32 to 1/8 inch. Three additional plastics are utilized in the design of this compact unit. Cellulose propionate was selected for the control knobs, manual operating dial, editing lever, and for a small hinged door attached to the projector's top panel. The slide tray is injection molded of general-purpose polystyrene. A blower, designed to keep slides at low temperature for long, in-focus viewing, is molded of nylon.

G-M Laboratories Inc., Chicago, molded and assembled the unit parts, using American Cyanamid urea; cellulose propionate from Celanese Corp. of America; nylon from Spencer Chemical; and general-purpose polystyrene supplied by Solar Chemical Co. The unit lists for $57.77.

Ethylene copolymer liner for one-use container

The weight- and space-saving features of a "bag-in-box" package, consisting of an ethylene copolymer film liner anchored within a bleached foodboard carton, have made it an effective replacement for glass bottles of ½-gal. capacity in the packaging of distilled and spring water.

Glenwood-Inglewood Co., Minneapolis, Minn., has reported that the switch from glass to the film-lined carton, in addition to obviating the handling, storage, and breakage problems traditionally associated with glass return bottles, now permits them to display four packages in the supermarket space formerly allotted to three bottles. In the plant, the unfilled package occupies about 10% of the storage space a bottle requires.



The light weight of the package is another desirable feature resulting in savings in handling and delivery costs. When filled, 12 ½-gal. packages approximately equal the weight of 8 ½-gal. filled glass bottles.

Unfilled, the package consists of a 2-mil extrusion-blown film liner, heat-sealed at the bottom and then positioned inside the flattened carton. It is bonded to the carton's front and back panels by a standard adhesive. Empty packages are shipped and stored flat, and filled and closed by a specially developed machine which glues and closes the carton's bottom flaps, fills it automatically, and carries it to an operator who guides the film liner through a heat-sealing unit. Top flaps are then glued and closed. When the carton is opened, the liner, trimmed at the top, serves as a pour spout.

Bemis Bro. Bag Co. developed and is marketing the Liquitainer package and the filling and closing machine. They report that the package has the temporary approval of FDA for food use and is currently being tested as a container for fluoridized water, soup, vinegar, and French dressing. The fact that freezing is said not to damage the package would appear to offer good potential for expansion into other food packaging applications.—**End**

LITERATURE

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Grundzüge der Spritzgusstechnik (Fundamentals of Injection Molding)," *by Walter Mink.*

Published in 1961 by Rudolf Zechner Verlag GmbH, Speyer am Rhein, Morschgasse 33-36, Postfach 68, Germany. 196 pages. Price: 14.80DM (about $3.75). In German.

Volume 2 in a series, this book on injection molding is jam-packed with excellent schematic and engineering drawings of all facets of injection equipment. The book discusses hydraulic systems, plastication systems, heating and temperature regulation, flow behavior of non-Newtonian melts, troubleshooting, post molding operations, and raw materials handling. An excellent book for the novice in injection molding, and an excellent addition for the experienced engineer's reference shelf. We only hope someone will see fit to publish this book in an English translation. One of the best overall up-to-date coverages of the subject we've seen in a long time.—*G.R.S.*

"Plastics Technical Dictionary," *by A. M. Wittfoht.*

Published in 1961 by Interscience Publishers Inc., 250 Fifth Ave., New York 1, N. Y. Volume I, English-German, 299 pages, $11.00; Volume II, German-English, 572 pages, $15.00. The set, $24.50.

For those whose work involves reference to the German plastics literature, this set of dictionaries will provide an invaluable tool. Thoroughly updated from the first edition, which was published by Carl Hanser Verlag several years back, the two volumes do a thorough job of defining plastics technical terms in German and English equivalents. Covered are materials, processing, and machinery terms. Where applicable, U. S. and German standards are cited. Profusely illustrated (*e.g.* the various glass fiber weaves, screw threads, vacuum forming, etc.) to facilitate a better understanding of terminology. In addition to the alphabetical section, there are heavily diagrammed appendices covering sheet forming and fabricating; molding and extrusion; casting; mixing and blending. Conversion tables for metric and English units of measurement are also included.

Production facilities. "Around the Plastics and Rubber World of A. Schulman, Inc." is a profusely-illustrated booklet showing the operations of this company, which has extrusion, compounding, and distribution facilities throughout the world. Special attention is given to the production facilities at Akron, Dorset, and Bellevue, Ohio; East St. Louis, Ill., and Orange, Texas. And there is a pictorial introduction of the sales staffs in New York City, Boston, Chicago, and Los Angeles. The booklet also discusses the European facilities in London, Paris, Hanover, Brussels, and Cologne. 40 pages. *A. Schulman Inc., 790 East Tallmadge Ave., Akron 9, Ohio.*

Molten caprolactam. Properties, general considerations, storage equipment requirements, special precautions, vapor pressure, melting and freezing points, etc., for caprolactam, which is used to manufacture plastics, film, coatings, fibers, etc. 22 pages. *National Aniline Div., Allied Chemical Corp., 40 Rector St., New York 6, N. Y.*

Modified acrylic. Physical properties, chemical resistance, advantages, applications, etc., for Implex R, a new, higher impact acrylic molding powder. 4 pages. *Rohm & Haas Co., Washington Square, Philadelphia 5, Pa.*

Fibrous glass-reinforced plastics. Catalog lists the variety of fibrous glass cloths, tapes, woven rovings, chopped strand mats, surface and overlay mats, continuous rovings, chopped strands, milled fibers, polyester and epoxy resins and hardeners, MEK and benzol peroxides, PVA films, color paste dispersions, diluents, accelerators, parting agents, pigments, and other supplies available for producing reinforced plastics. 16 pages. *Cadillac Plastic & Chemical Co., 15111 Second Ave., Detroit 3, Mich.*

Peroxide compounds. Application and shipping information, flash points, half life, melting points, etc., for a line of organic peroxides and compounds for the plastics and other industries. 12 pages. *Wallace & Tiernan Inc., Lucidol Div., 1740 Military Rd., Buffalo 5, N. Y.*

Phenolic-asbestos molding compound. Brochure features data on Thermomat, a non-woven asbestos felt saturated with a phenolic resin, plus an organic filler, which is used to fabricate parts and materials for spacecraft and missile applications. Includes tabular data on available styles; mechanical, thermal, and electrical properties of the molded parts; etc. Catalog PK-162A. 28 pages. *Johns-Manville, 22 E. 40th St., New York 16, N. Y.*

Extruders. Specifications, features, and other data on a line of 2½- and 3½-in. plastics extruders. Units are available in L/D ratios of 20:1 or 24:1. *National Rubber Machinery Corp., 47 W. Exchange St., Akron 8, Ohio.*

Polystyrene. Features, molecular weight, specifications, solution viscosity, etc., for Synpol 1061C, a light-colored polymer developed specifically for manufacturing impact or rubber-modified polystyrene interpolymers. Bulletin 5. 5 pages. *Texas-U. S. Chemical Co., 9 Rockefeller Plaza, New York 20, N. Y.*

Vibratory feeders. Specifications and features for a line of pneumatic vibratory feeders with air pressure ranging from 20 to 70 p.s.i. Bulletin 303. 4 pages. *National Air Vibrator Co., 435 Literary Rd., Cleveland 13, Ohio.*

Thermoplastic machinery. Specifications, features, and other data on a complete line of extruders, with screw sizes from 1 to 12 in. in diameter; chill roll casting equipment; blow molding machines; blown film units; monofilament line equipment; and similar machinery. 16 pages. *Modern Plastic Machinery Corp., 64 Lakeview Ave., Clifton, N. J.*

Decorating Polyolefins. "A New and Simple Method for Coating, Printing, or Decorating Pro-Fax (Polypropylene) or Hi-Fax (Polyethylene) Molded Objects" discusess such subjects as: "Disadvantages of current methods," "Principles of new method," "Details of solvent pretreatment method," "Coatings for pretreated objects," "One-step method for simultaneous treatment and coating," etc. 6 pages. Another 3-page bulletin from the firm outlines the types, nomenclature, and typical uses for 0.945- and 0.962-density polyethylene resins. *Hercules Powder Co., Wilmington, Del.*

Polyvinyl acetate. Grades, solubility, viscosity, compounding, storage conditions, applications, etc., for Gelva polyvinyl acetate resins, emulsions, solutions, and powders. 40 pages. *Shawinigan Resins Corp., Springfield 2, Mass.*—**End**

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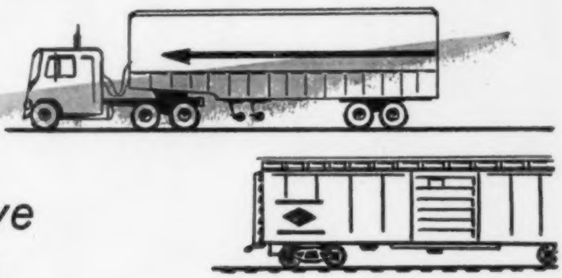

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New machinery-equipment

(From pp. 50-58)

automatic insertion, quick-trigger action, and steady readings. Similar instruments are available for tension measurement in wire and cable and monofilament extrusion processes. All instrument models are priced at $150 each. *Testing Machines Inc., 72 Jericho Turnpike, Mineola, N. Y.*

Vacuum gage

Suitable for monitoring vacuum levels in metallizing and vacuum-forming operations, the Hastings Compact indicating vacuum gage is miniaturized to fit in any panel having a standard electrical meter cut-out. Completely self-contained, the instrument operates on the patented Hastings thermopile principle using a transistorized circuit. Three ranges are offered from 0.2 microns to 20 mm. of mercury (vacuum). Miniaturized switching attachments are available to enable one instrument to monitor up to five vacuums. Matched interchangeable gage connection tubes, specifically designed and color-coded for each pressure range, incorporate compensation for ambient temperature and rate-of-change of ambient temperature compensation, and will withstand extreme shock, vibration, and atmospheric exposure. Unit is immediately available. Price with gage tube: $110. *Hastings-Raydist Inc., Hampton, Va.*

Thermistor probes eliminate calibration

Matched thermistor probes, now offered as standard on Fenwal 500 line of indicating electronic temperature instruments, allow the probes to be installed in the instrument without calibration. An added advantage is that the thermistors may be used with ordinary uncompensated lead wire. Use of matched probes has not increased the instrument cost. *Fenwal Inc., Pleasant St., Ashland, Mass.*

Drills for plastics

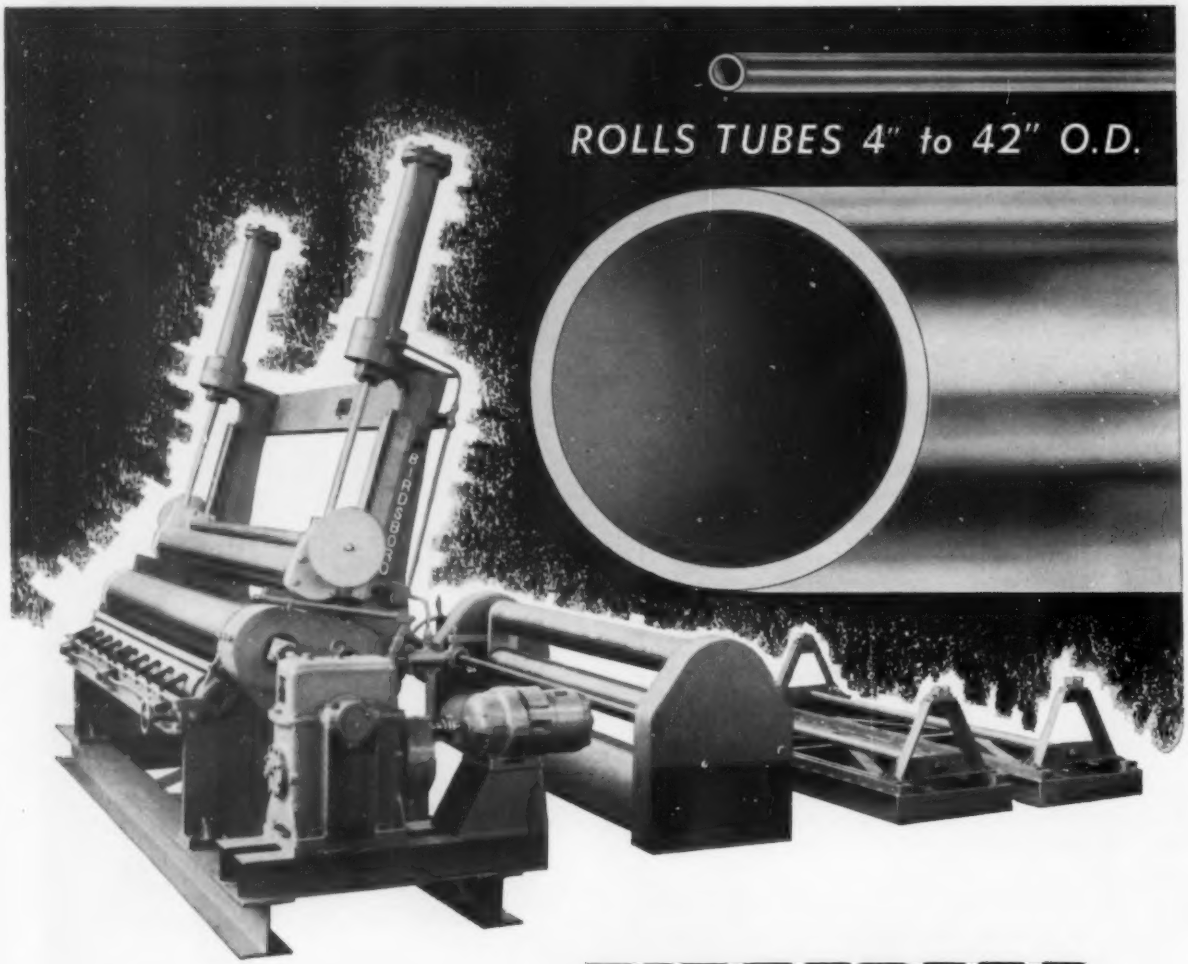
This line of abrasive core drills has been designed for use with hard plastics such as the thermosets and fibrous glass-reinforced materials. Standard machines will drill holes having outer diameters of from ½ to 6 inches. Finished holes are reported to be clean and drill penetration is rapid. Chief advantage of the drilling method is that holes may be cored for ⅓ to ½ the cost of other known methods. Other advantages are said to include the lack of a need for bracing or cooling water, inexpensive bits, low maintenance, semi-automatic operation, and portability. *The Howe-Simpson Co., 136 E. Gay St., Columbus 15, Ohio.*

Hot stamper for PE bags

This hot transfer leaf printer applies indelible imprints on heavy-wall polyethylene bags. The solenoid-controlled, air operated unit uses heated metal type and a hot printing head to permanently transfer the thermoplastic die imprint from a roll of tape to the bag. The automatic leaf feed is completely adjustable as is the heat dwell and control. Close control over dwell and temperature provides the unit with the ability to help prevent sealing of the bag walls during the imprint cycle. After insertion of the throat of the machine, the bag is automatically positioned by the printer, which then imprints a code number product identification, or other information. *Industrial Marking Equipment Co. Inc., 655 Berriman St., Brooklyn 8, N. Y.*

Foam fabricating equipment

Two machines, the Kadet Vertical Saw and the Kadet horizontal splitter have been designed to sell at a low price for the benefit of the small producer of fabricated plastic foams. Both are designed **(To page 170)**



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to trim foam block stock to desired dimensions. The saw has an 82-in.-wide by 125-in.-long table, a cutting head with a throat clearance of 48 in., and a free cutting height of 36 in., expandable to 42 in. for higher blocks. Material is pushed into the cutting knife by the operator. The cut stock may then be removed or the table returned with cut stock in place. The horizontal splitter will split and level blocks into any desired thickness from 1/16 to 14 in.; the working table is 72 in. wide and 125 in. long. Feed is manual similar to the saw. Cutting head height is remotely controlled and an idler compression roll holds the stock during the cut. A special snap-on guide is furnished with the splitter for thin sheet work. Both machines together are priced at a total under $6000. *Femco, 1734 Front St., Cuyahoga Falls, Ohio.*

. . . Machinery in brief

▶ The Model 154A marking machine places an imprint up to 2 by 6 in. on each of three sides of rectangular objects, using inks comparable with the surface to be marked, at speeds up to 1000 units per hour. *Markem Machine Co., Keene 68, N. H.*

▶ An extruder measuring head for its Plasti-Corder has been introduced by *C. W. Brabender Instruments Inc., South Hackensack, N. J.*

▶ Two lightweight industrial magnets, with lifting capacities of 1500 and 4500 lb., have been developed for use in mold and die plants. *D-M-E Corp., 6686 E. McNichols Rd., Detroit 12, Mich.*

▶ The Thermo Electronic Economy Monitor is designed to monitor from 1 to 10 temperatures, pressures, etc., and compare these values against a set-point. *Thermo Electric Co. Inc., Saddle Brook, N. J.*

▶ Apparatus for measuring melt index according to ASTM D-1238 is now available. *Custom Scientific Instruments Inc., Kearny, N. J.*

▶ The first complete line of solid state regulators and exciters, eliminating the use of electron tubes for variable speed drives, has been announced by *Reliance Electric & Engineering Co., 24701 Euclid Ave., Cleveland 17, Ohio.*

▶ Improved air cylinder with a flange rod seal, called Base-Lok, so securely locked in place that it replaces a bushing seal, eliminating need for separate rod bushing seal and pressure balance screen. *Miller Fluid Power Div., Flick-Reedy Corp., Bensenville, Ill.*

▶ Called the Bulletin 725 Cycl-Flex Counter, this instrument is designed to open or close a switch after a pre-set number of counts. It is spring-reset to "0," making it applicable to automatic control circuits which function from counts. *Eagle Signal Co., a div. of The Gamewell Co., an E. W. Bliss Co. subs., 202-20th St., Moline, Ill.*

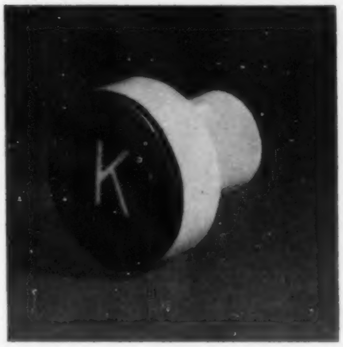
▶ Now available with 15-, 36-, and 42-in. chambers, A-C's synchronized dual-drive vibrating grinding mill has had its vibrating mechanism relocated outside the grinding chamber adjacent to it, resulting in longer component life and easier maintenance. *Allis-Chalmers Mfg. Co., Industries Group, Milwaukee 1, Wis.*

▶ Dynapar has announced a complete line of transistorized digital process controllers for industrial, counting, measuring, and control applications. Equipment is operated after a preset number of pulses has been counted. *The Louis Allis Co., 427 East Stewart St., Milwaukee 1, Wis.*—**End**

Molded-in foils

(From pp. 88-89)

are some of the more recent samples in this grouping. Although the emphasis here is on knobs and dials for such appliances as washing machines, refrigerators, dishwashers, mixers, etc.—the first of the major markets in England to make use of foiling for industrial marking—Ornamin reports interest in the technique from other areas. English automobile manufacturers are evaluating use of the foils for



gear shift levers, knobs, and dials. Machinery manufacturers are also studying foil possibilities for many components which are now marked by engraving around the periphery and wiping the color in—a relatively costly operation. In another unusual take-off, foils are now being investigated in England for marking elevator pushbuttons (see photo, above). Heretofore, the buttons were marked by molding in aluminum inserts and then buffing the surface of the metal down to a smooth finish. With the foils, finishing operations are, of course, eliminated. Furthermore, since there are between 50 and 60 letters and numbers required for the series of buttons, additional costs savings are implicit in the ease with which alternative printed foils can be used.

Credits: End-users and molders of the products discussed, as indicated by the caption number, are: **1)** Kenwood dishwasher knob—Viking Industrial Plastics Ltd.; **2)** Murphy television knobs—Viking; **3)** Servis Washing Machine switch knob—Rootes Mouldings Ltd.; **4)** Flavel gas fire knob—Industrial Mouldings (Warwick) Ltd.; **5)** Gas appliance knob—M. Howlett & Co. Ltd.; **6)** Kenwood Chef Mixer knob—Viking; and Elevator button **(above)**—F. W. Evans Ltd.—**End**

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Inflatables		■						■	■	
Industrial Tapes				■	■	■	■			■
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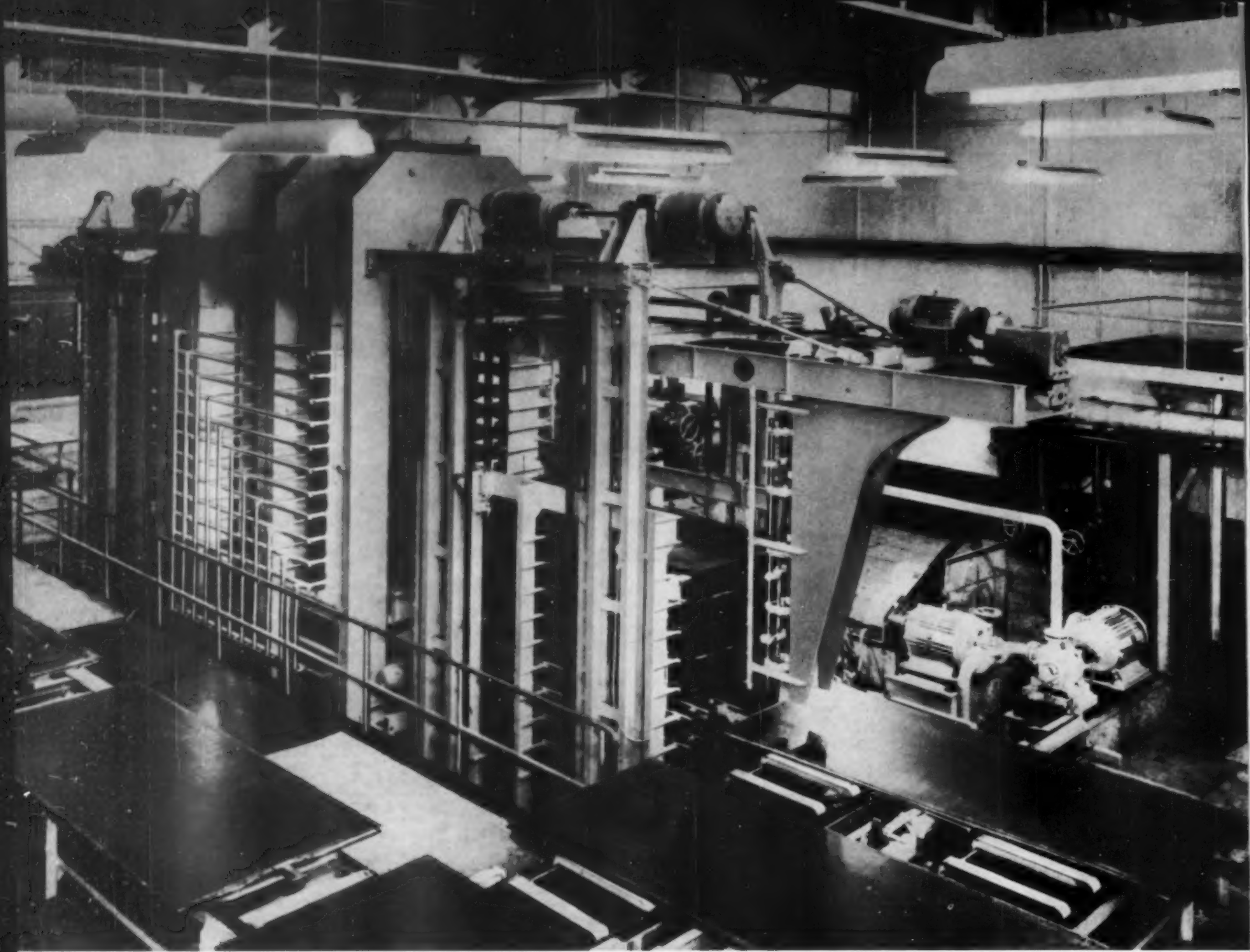


Powdered PE

(From pp. 90-93)

the Heissler method (practiced by Delaware Barrel and Drum) is that these techniques permit the economical production of large-size PE parts. Now another process, aimed at the same field, has been announced by County Plastics, Bellmore, N. Y.

The company is adamant about not revealing details of its technique. But this much can be stated: unlike the Thermofusion process (where molds are stationary), the company uses a rotational system of molds. Unlike the Heissler process, County Plastics uses exact premetered charges.

The company specializes in cylindrical shapes, for which it uses very thin sheet metal molds, which enables it to work on cycles as low as 3 min., while rotational molding, as mentioned above, has cycles more in the 10-min. range. The machinery, designed by the company itself, is essentially a considerably lower cost and simpler version of standard rotational molding machines. Equipment now in use permits molding sizes up to 36 in. high by 30 in. in diameter.

Barrels and containers produced by the company go into such applications as chemical storage, water softening, meat pickling tanks, and refuse collection cans.

This last application is particularly outstanding. These cans are used by sanitation men to bring refuse from the back of a house to the garbage truck. During the course of a working day, these cans get an inordinate amount of abuse. Their service life is 6 months. Equivalent steel tanks last 2 weeks. Other materials have reportedly lasted less than a day.

Competition for blow molding?

Since rotational molding, like blow molding, produces hollow objects, there seems to be an area where the two processes are, or will be, in direct competition.

It should be emphasized again that rotational molding is not applicable to high-density PE resins; so this entire market is presently beyond the reach of the new material. It should also be kept in mind that in order for rotational molding to equal or surpass the production

rate of blow-molding machines, a large number of identical molds have to be used. For example, in order to match the output of a blow-molding machine producing 10 bottles per minute, a rotational molding unit would have to use 100 molds at the same time during a 10-min. over-all cycle. The cost of a rotational mold (split cast aluminum) for a 6-oz. Boston round bottle may be around $50 per mold, for a mold cost of $5000 just for this one job. A blow mold for this bottle would be in the vicinity of $200. However, in the larger sizes, and especially in complicated configurations, the two processes converge in production rates. Although not enough experience has been gained in this field, some observers feel that the break-even point lies somewhat above a 5-gal. container size.

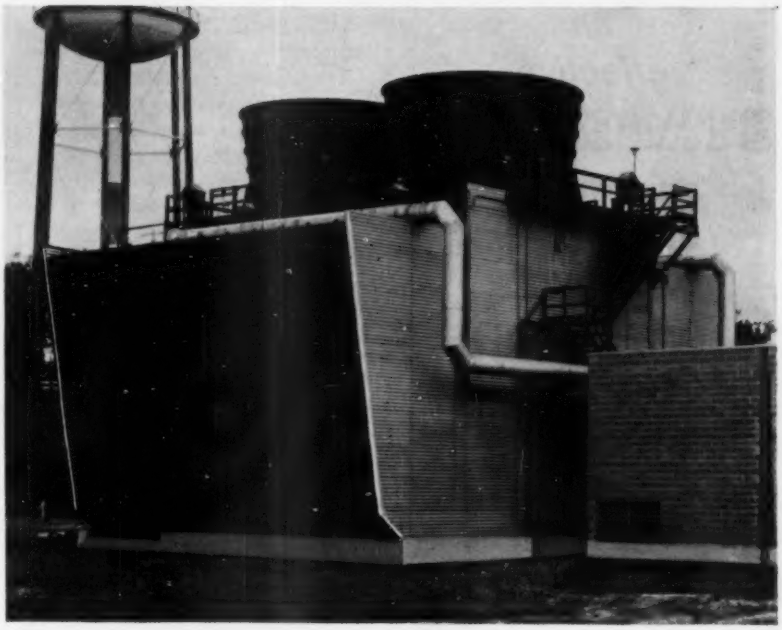
And at the point where equal outputs are achieved at the same cost, powdered PE, rotationally cast, is claimed by its proponents to have the edge over blow molding because of several factors:

1. Unlike blow-molded items, products rotationally molded of polyethylene powder have uniform wall sections. A toy football, for example, uses 52 g. of resin, compared to 82 g. for the same ball when blow-molded. The blow-molded ball used a 27.5¢/lb. resin, the one rotationally molded a 35¢/lb. polyethylene. Assuming all other conditions were equal, material cost for the rotationally molded ball would be about 20% lower than for the blow-molded item.

2. Powdered PE advocates also point out that rotationally molded items are free of stresses, which is not usually the case in blow-molded PE products.

While most observers are inclined to discount powdered PE penetration in the bottle market, they feel that the battle will soon be joined insofar as large and complex hollow items are concerned. In fact, there are several applications out for bid now where both alternatives are being seriously considered.

One of the first products that has been switched from blow molding is a bellows produced by Talimac Inc., Hicksville, N. Y., for The Holiday Line, Brooklyn, N. Y. The bellows (see photo, p. 91), is used inside inflatable mattresses for self-



inflation and is also sold as a separate unit for inflating other items. According to the molder, uniformity of wall section was the big advantage in this case. Because of variations in thickness, the blow-molded item was said not to have functioned properly. This bellows is perhaps the first product outside the toy and novelty field rotationally molded of powdered PE and may represent the forerunner of other similarly produced industrial items.

Carpet backing— biggest market today

The biggest consumer of powdered PE right now is automotive carpet backing. All of General Motors 1962 standard body models will have such carpeting. Around 2.6 million cars are involved in this program, accounting for an estimated powdered PE consumption of 5.8 million pounds. Other car makers are reportedly looking into this type of floor covering with intense interest. Should they adopt it, total consumption for this application alone could reach over 13 million lb. annually (based on a 6.2-million-car year).

Powdered PE is used in this application for two reasons: 1) to lock the tufts of the carpeting in place, and 2) to make the carpet moldable. The idea of the moldable carpet arose in the late Fifties, when car floors began to get lower and lower and humps to accommodate the transmission replaced the flat floor. Ford uses the cut-and-sew method to cope with this problem; Chrysler uses a latex backing. Apparently, the lowest-cost method is the one used by Ford; however, it is said to pose appearance and wearability problems. PE-backed carpeting costs about $1 more per car, latex-backed is about $2 more.

The big difference between powder used for carpet backing and the grades used for rotational casting is price: it sells for 27½¢/lb., the same as standard molding grade resin. The prime reason for this price difference is the fact that the powder is much coarser (requires considerably less processing to make). It is not considered suitable for rotational molding. Typical resins used are 0.923 density, with melt indices ranging from 3.7 all the way up to 22.

This application was pioneered

back in 1959 by Collins-Aikman, major automotive carpeting supplier. Since then, several other carpeting firms have gone into it and have installed the equipment necessary for this process. Still others are handling the backing via custom extrusion coating. However, the costs involved in shipping carpeting to and from an extrusion coater make the economics dubious.

Equipment used by carpet companies is generally of their own development, and the exact machinery and techniques used is a closely guarded secret. Generally, the coating lines operate as follows:

A powder-feeding hopper distributes powder uniformly across the width of the carpeting moving beneath it. Web speeds normally range from 30 to 60 ft./min. The carpet then passes through an oven where the PE powder melts, flows around the jute backing scrim, and locks around the carpet tufts. The oven presents a special problem because, while it must be hot enough to melt the powder, the face of the carpet must be kept relatively cool (a typical situation might be 400° F. on the PE powder, 270° F. on the carpet face). At the end of the tunnel, the carpet travels through two nip rolls which provide final cooling and press enough PE into the tufts to assure a positive locking action (auto makers call for a minimum PE thickness of 12 mils). The carpet is then die-cut to the requisite area and molded between matched metal dies to the necessary contours. During the molding process a ½-in.-thick backing of jute felt is bonded to the carpet, with the PE coating acting as the "adhesive."

With automotive carpeting now established as a market, what about related application areas? An obvious field to pursue is, of course, regular house carpeting; and this is indeed being seriously looked into. The economics seem to be right: good quality carpeting carries a cost of around 18 to 20¢/sq. yd. for synthetic rubber latex backing; 12-mil PE powder coating would come to 14¼¢/sq. yard. In addition, the PE backing would serve as an effective moisture barrier in those cases where the carpeting is used on top of a concrete slab.

Aircraft carpeting, of course, is another potential. And there is the big field of non- **(To page 185)**

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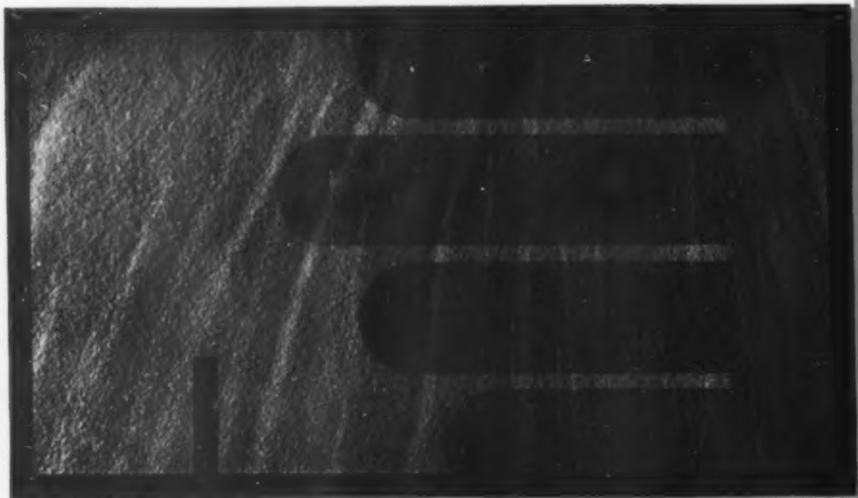
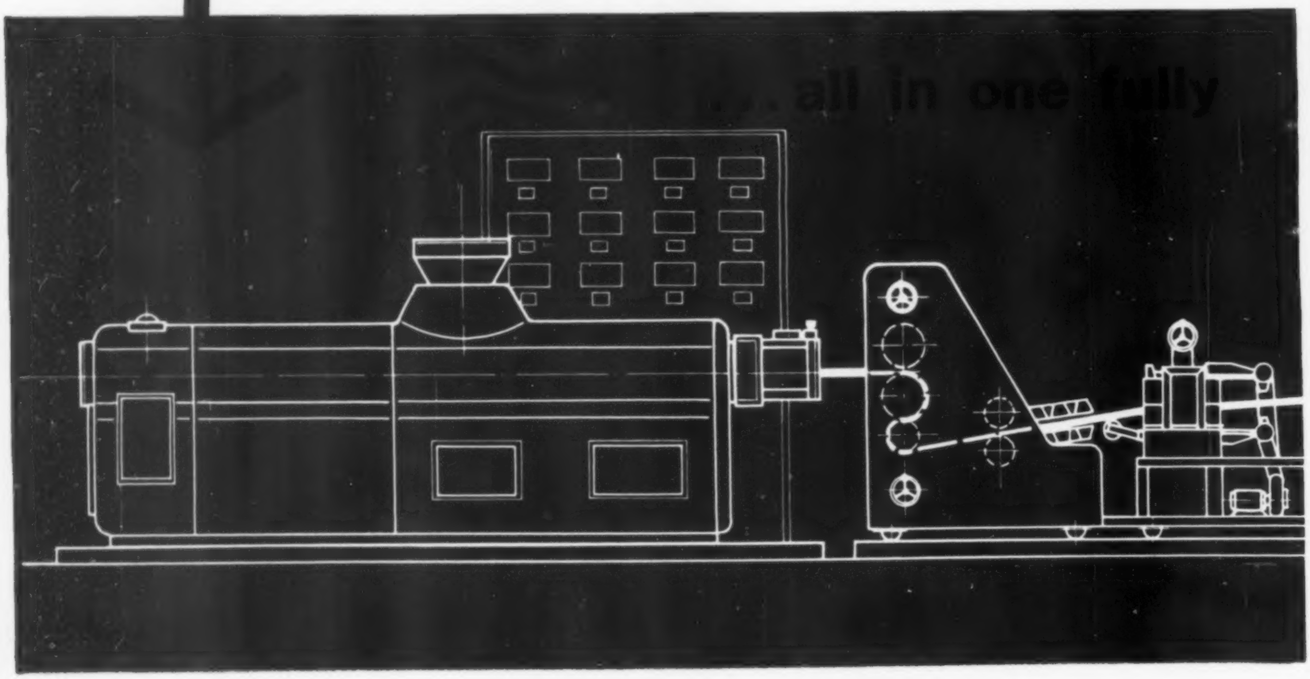


from powder...



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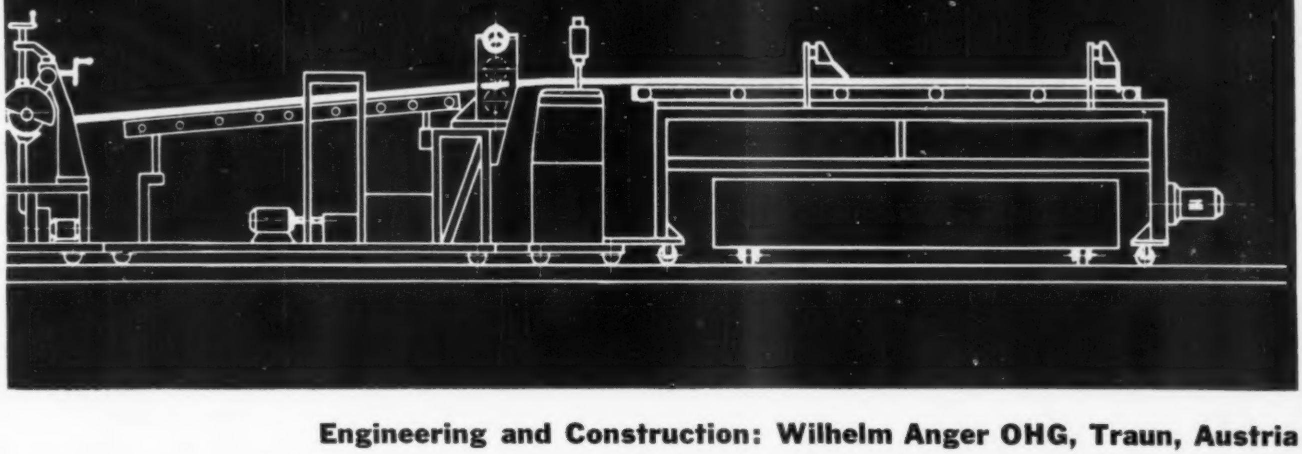

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woven fabrics for textile laminations, where the PE coating can act as a stiffening member, or as an adhesive (*e.g.,* in urethane-to-cloth laminations). If it is deemed necessary, the coatings can be made porous ("breathable") through irregularity in application.

Altogether we can look forward to major expansion in this whole diversified market.

The outlook

In the short time it has been around, powdered PE has already spawned a great variety of processing methods . . . But it has by no means exhausted them.

What about spraying? Can a flocking gun be used to deposit powder onto a heated mold to make large objects? Work along those lines is going on.

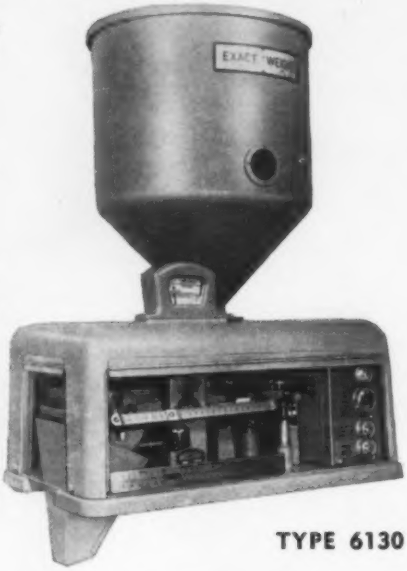
What about coating? Can a heated glass bottle be coated by rotating it in a bed (not fluidized) of powdered PE, thus making it shatterproof? Work along those lines is going on.

What about rotational molding without ovens? Can a system be designed where heating is accomplished without use of an oven, so that size limitations are removed and cycle time shortened? Work along those lines is also going on.

What of improved powders? Considerable effort is being expended in formulating the proper resins for powder molding. Much of the molding work done to date is based on slow trial-and-error determination of proper resin. But the day is not too far off when standard formulations, in a range corresponding to regular molding powder, will be available. And not only PE. Several other materials, especially the polyacetals and PVC, are currently undergoing close scrutiny in terms of powder-molding technology.

All in all, powdered plastics is a field that will bear close watching by the industry.

Credits: Powdered PE resins supplied by Du Pont; National Distillers, U.S.I. Div.; and Spencer Chemical. Molding machinery for hobby horse and artificial fruit, The Akron Presform Mold Co., Cuyahoga Falls, Ohio; bellows and experimental products shown are molded on equipment supplied by Mercury Molding Machinery Inc., Yorkers, N. Y. Other suppliers of this equipment are listed on p. 1119 of the MODERN PLASTICS *Encyclopedia Issue* for 1962.—**End**



Urethane foams

(From pp. 95-100)

note this one carefully—because the foam upgrades the end-product, a cotton fabric can successfully replace a heavier woolen fabric in many types of garments.

To apply the backing, the textile industry has come up with several techniques. First of all, the foam is supplied to them in the form of a thin-gage sheet, 1/16 to 1/8 in. thick, slit or peeled off the slab stock bun. With slitting, knives slice the buns horizontally into thin panels; with peeling, a core is removed from the center of the bun and the four edges are cut to produce a urethane log that is then peeled off with special cutting knives.

In the hands of the foam-fabric laminators, this thin-gage sheet can be laminated to the substrate (which can be Neoprene, vinyl, or polyethylene skin, as well as a textile) by one of two methods: 1) flame lamination in which the foam is passed rapidly over an open flame and applied immediately to the substrate in order to effect a permanent bond; and 2) conventional adhesive lamination.

Pointing up the importance which the use of foam backing is beginning to assume is the intensive work now going on in refining laminating techniques even more. Specialty Converters Inc., East Braintree, Mass., is working on a method for casting the foam directly onto a backing. Technifoam Corp., New York, N. Y., also claims to be developing a method by which foam laminates can be continuously produced. A special roller system that meters the amount of liquid applied to the skin is the key to the operation—and substrates under evaluation include kraft paper as well as textiles. From the Sterling Alderfer Co., Akron, Ohio, comes reports of a new method being used for simultaneously bonding the foam to rolls of base materials as the foam is skived in continuous lengths from the foam log.

What is also most notable about all this development work going on is that it is not being limited to the use of textile substrates. Reeves Bros. Inc., New York, one of the pioneers in foam backing, reports on such possibilities as foam laminated to vinyl for sound-deadening

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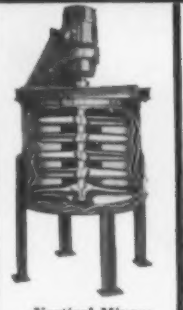

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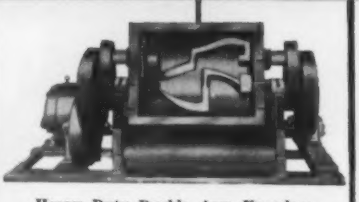

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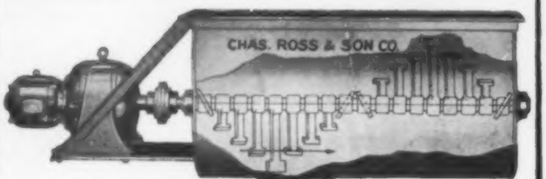

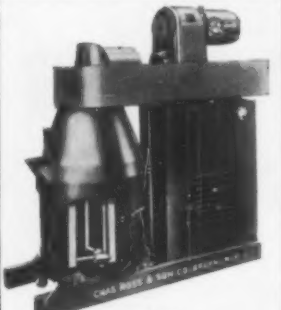

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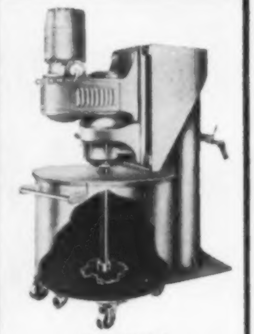

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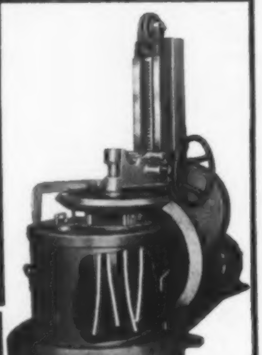

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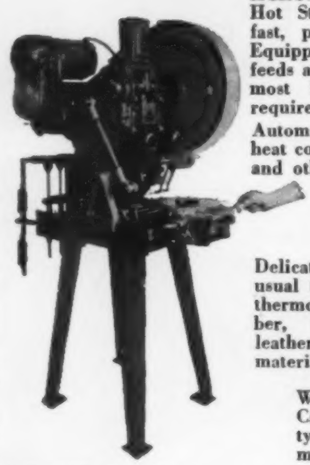

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wall coverings, foam laminated to terry cloth for bathroom mats, or foam laminated to vinyl or Neoprene for outdoor shelter coverings. Scott Paper has used the foam as a laminate for the inner linings of shoes to improve comfort and shape retention. Foam-backed draperies are in the works. Foam-backed papers for insulated bags are being evaluated. And in the realm of possibility for the future are low-cost, lightweight blankets.

Moving into new areas

While the volume markets described above have been getting all the play, some smaller markets being developed have caught the eye of end-users as indicative of flexibles' application versatility.

As one example, according to the Sponge Information Bureau, estimated retail sales of urethane sponges in 1961 was over $10 million. And there are markets still to be tapped. Unlike conventional sponges, urethane can be made in a range of densities and coarsenesses; they can be impregnated with liquids, and easily laminated.

Industrial applications for flexibles, as another example, are only now being investigated—and the surprise is that the move hasn't come any earlier. Flexible urethane, after all, has good insulating characteristics (0.25 to 0.3 K factor at densities of 1.5 to 1.8 lb./cu. ft.) and the distinction (in contrast to such competition as fibrous glass) of being available in lightweight, convenient sheet form—as easy to handle by the maintenance engineer in the field as by the do-it-yourselfer at home. Here are two recent applications that point up the possibilities in this area:

1. H. E. Werner Inc., Bethel Park, Pa., has just put on the market a flexible urethane foam pipe covering for liquid cooling and heating lines, chilled water lines, and other processing lines. Because of flexibility, installation of the coverings is fast, easy, and economical—even in close quarters, around 90° turns, or over "T" joints. And the resilient foam can reportedly take abuses that would normally damage ordinary coverings.

2. Flexible foam, from Reeves Bros., laminated to a 15-gage vinyl sheet is being used by a chemical manufacturer to (To page 192)

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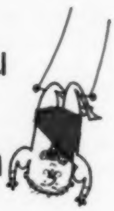
Escon® polypropylene brings you a balanced  combination of properties for high-speed, low-cost molding. It has rigidity, surface hardness and strength  yet plenty of resilience,  so you can strip undercut parts from molds with almost no breakage or permanent distortion. **Escon** polypropylene performs well at maximum ram speeds  and stock temperatures from 450-500°F (slightly higher for large items). Its dimensional stability practically ends post-mold shrinkage.   And don't forget that polypropylene yields more parts per pound than any other commercial polyolefin molding material. For full details on how **Escon** can help you hold down costs  while reaching new heights in  performance, write to Enjay at 15 West 51st St., N.Y. 19, N.Y.

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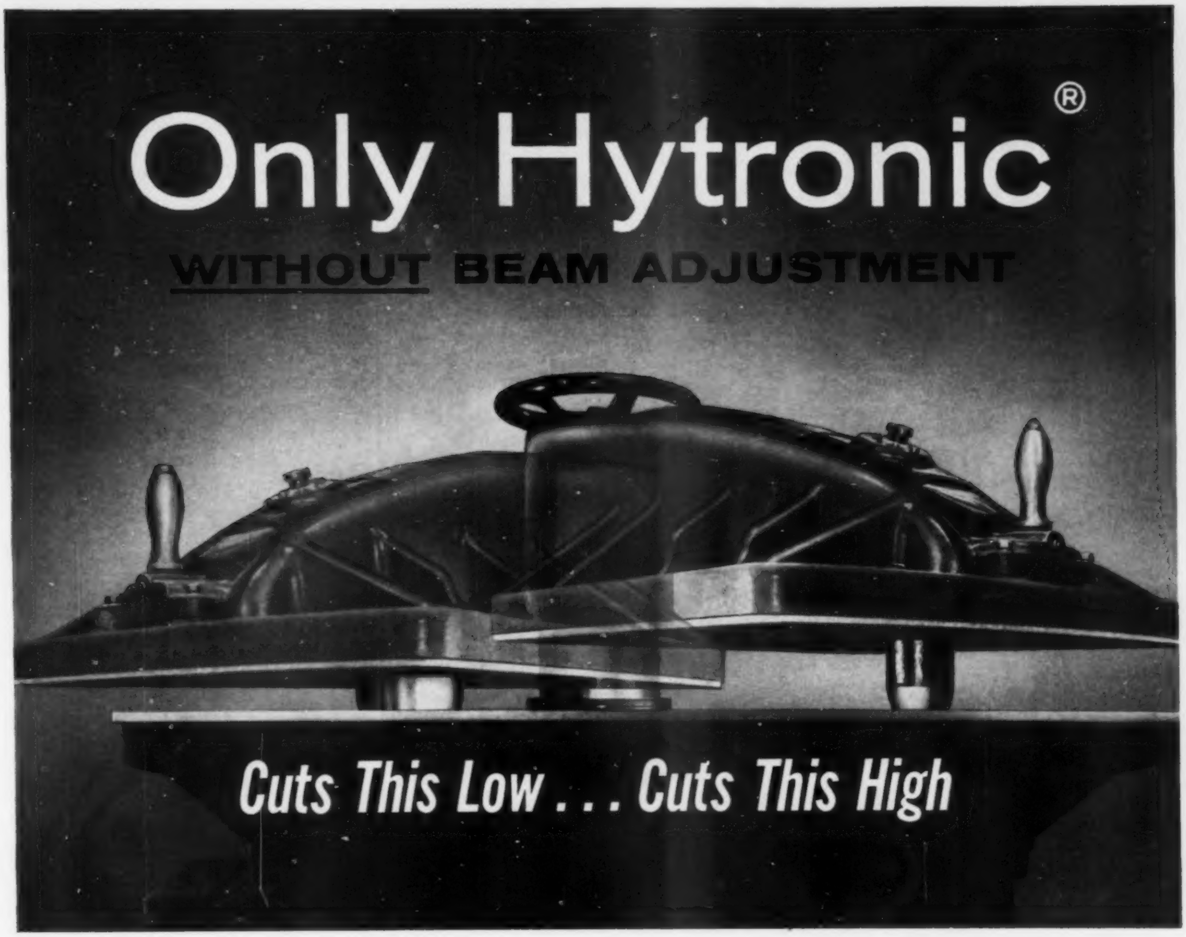

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replace magnesia and fibrous glass in the insulation of chemical storage tanks and processing equipment. Result: a 30% savings in installed cost. The vinyl-foam laminate is applied under pressure to a surface with the aid of mastic cement and joints are sealed with an adhesive PE tape.

Packaging applications, another of the new directions for flexible foams, points up two of the more important features of the material. First, through them, industry has become aware of the outstanding shock absorbency offered by urethane. Typical of the products that are bringing this point home is a package developed by Micro-Switch Div., Minneapolis-Honeywell Regulator Co., for shipping fragile mercury switches. Four million switches shipped in foam thus far—and not one case of breakage reported! In addition, the foam packages are not affected by heat (up to 350° F.), cold, and moisture and resist most solvents, chemicals, mildew, rot, and vermin.

Second, packaging applications emphasize urethane's adaptability to diverse fabricating techniques. Slab stock can be die-cut into packaging supports and platforms; contoured packages can be die-cut or molded; like the rigids, the flexibles can be poured in place around a product; sheet is available for lining a package; and here is the latest approach that is currently being evaluated: very-thin-gage protective wrapping for packaging such fragile products as china and glassware.

Sound absorption properties—the ability of the foam's cellular structure to trap and break up incident sound waves—also figure in several new applications for foam. Slab stock, for example, is an effective inner-liner for surfaces of record players and high-fidelity speaker units. Flexible sheeting is also being offered by Plastomer Corp., Detroit, Mich., as a noise deadener for outboard motors. Bonded directly to the inside of removable motor shrouds, the foam soaks up engine noise—while resisting the effects of engine oils.

Sound absorption, coupled with a load-compression curve particularly suited to the dissipation of high-impact energy, also plays a role in the use of flexible foam (from Nopco Chemical Co.) as the

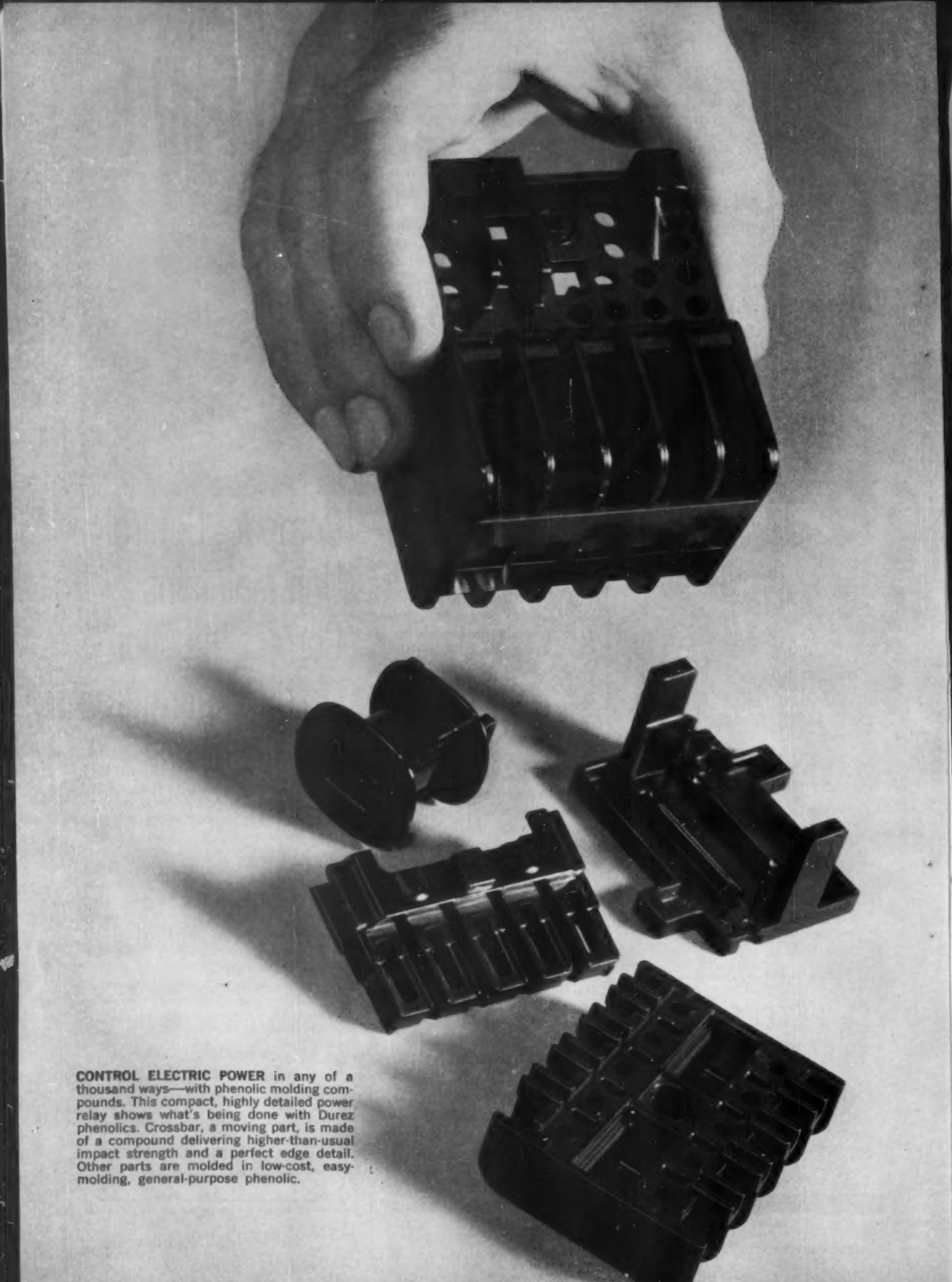
liner in the helmets used to protect American astronauts.

And pointing up versatility even more, here are three further new directions in urethane foam use:

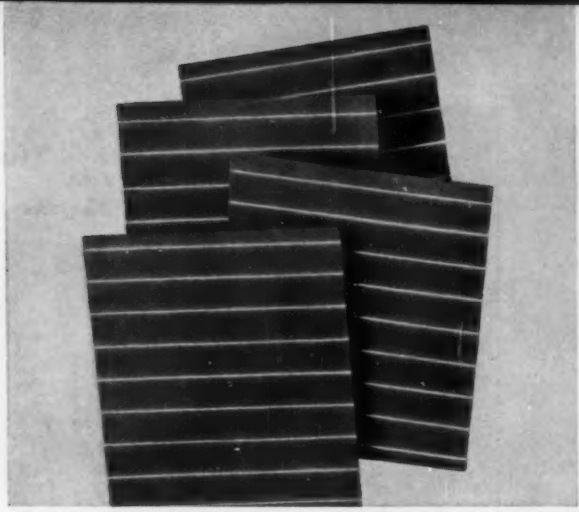
- From Scott Paper Co., a special flexible foam (made by leaching out cell walls so that only connecting strands remain) that is finding increased use as an air filter medium in central ventilating systems, as an air intake filter for auto carburetors, in air conditioners, and in warm air furnaces. Because of the open cellular structure, the filters can hold considerable quantities of dust and other air contaminants; and, unlike the metal filters previously used, are washable and immediately reusable without oiling or other treatment. Also from Scott: a unique, fluffy, lightweight foam (a special open-pore, high-density type with more than 100 pores/lineal in.) that is providing exceptional softness, smoothness, and absorbency in the manufacture of powder puffs.
- From Air-O-Plastik Corp. comes a special flexible foam stripping with a self-adhesive backing. After removal of a protective paper backing, the foam adheres to any clean, dry surface. Potential uses already mentioned: weather stripping, gasketing, case liners, display items, dust seals in TV sets, sound deadeners under car hoods, and insulation in gas detection equipment.
- From Pacific Sealants, Long Beach, Calif., comes a compressible waterproofing sealant developed in Holland and made by impregnating urethane foam with asphalt bitumen. Under compression, the foam becomes completely water-tight. Its cost per unit of volume is said to be comparable with other high-quality caulking and sealing materials, while labor costs of installation are significantly lower. The material has permanent resiliency and constantly strives toward its original shape and size, even under concentrated and prolonged loads. When all pressure is released, it will return to this original shape.

A guide to end-users

In light of this diverse range of application possibilities for the flexibles—and the equally as diverse range reported last month for the rigids—it is small wonder that the approaches by **(To page 197)**



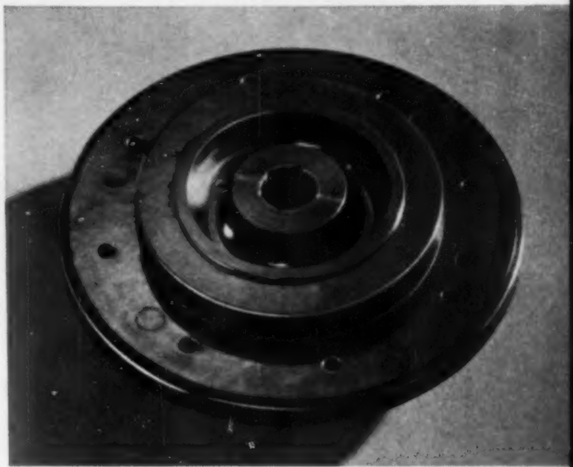
CONTROL ELECTRIC POWER in any of a thousand ways—with phenolic molding compounds. This compact, highly detailed power relay shows what's being done with Durez phenolics. Crossbar, a moving part, is made of a compound delivering higher-than-usual impact strength and a perfect edge detail. Other parts are molded in low-cost, easy-molding, general-purpose phenolic.



DEFEAT ACID with, of all things, **paper** plus a Durez phenolic resin. Such impregnated paper forms these tough battery separators. It can become an oil filter. An economical tube that machines well and weighs a fraction of a metal one. A hard, stiff laminate unbothered by boiling water or alcohol. Its possibilities seem endless.

KEEP HEAT IN ITS PLACE with a plastic that stands up to rough usage and molds to unusually close tolerances. Durez high-impact, fibrous-glass-reinforced molding compounds do this, **and more,** for all kinds of products—from this stud welder gun housing to the insulation linings on rocket motors.

MAKE A BREAKTHROUGH with a fire-retardant structural material that combines strength and fatigue resistance with light weight. Reinforced Hetron® polyester resin keyed the development of this new idea in aircraft. It forms the gyroplane outer body, eliminating expensive tooling and panel work on the multi-curved fuselage.



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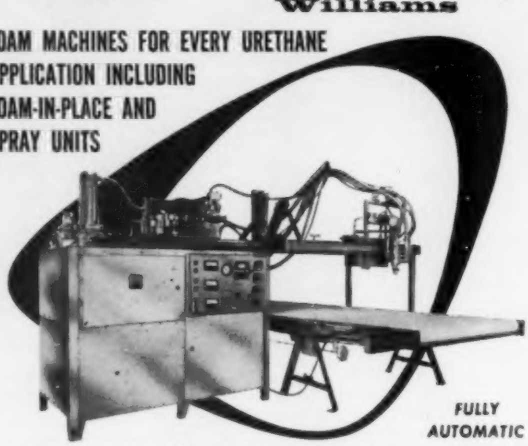

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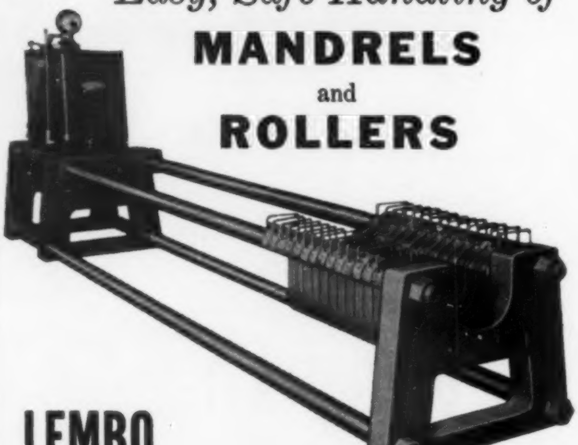

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which the end-user may enter the field are many and varied.

Perhaps the best way to make the approach, however, is through an understanding of the makeup of the complex foam industry. At the top of the ladder, of course, are the suppliers of the two basic raw materials that go into urethane foams—isocyanates and polyols (polyesters or polyethers). In flexibles, polyethers, offering lower costs and better cushioning characteristics, have pretty much taken the play away from the polyesters. Although there are some specialized uses for polyesters (*e.g.*, the filters and insulating materials described above), the only really big area in flexibles still held by them is in garment lining. In rigids, the polyethers again have a price advantage as compared to the polyesters. Polyesters are still being used, however, particularly where flame-resistant grades or better dimensional stability in the higher temperature range is called for; polyester suppliers are still gunning for the building market in rigid foams.

In effecting the final urethane formulation, of course, other ingredients are called for, including catalysts (*e.g.*, tertiary amines or some form of metallic salts and organo-metallic compounds), fluorocarbon blow agents (most rigid foams use this technique to obtain lower densities and better insulation values), surfactants, etc.

The routes by which these raw materials pass down to the processor and subsequently to the end-user are equally as varied. Slab stock—both flexible and rigid—is, of course, available. And in instances where volume warrants, some manufacturers (*e.g.*, furniture) have purchased metering and mixing equipment and set up their own flexible slab lines (using the one-shot system). In molding flexible urethane parts, prepolymer systems have already been perfected and one-shot systems are being developed. The services of custom molders of flexible urethanes are also available.

In the rigid field, as described in last month's issue, prepolymer suppliers are still key intermediaries. Buying the raw materials direct and formulating for a one-shot rigid system is still a tricky business at best and, because one-shot rigids involve

higher exotherms and pressures, processing is more difficult than it is with the flexibles. Chances are that in the near future, only the large-volume users, *e.g.*, refrigerator manufacturers, will be able to afford going to one-shot systems to take advantage of the cost savings (rigid prepolymer systems cost between 50¢ and 60¢/lb.; one-shot systems could cost out between 40¢ to 45¢ lb.). Rigid prepolymers, of course, can be handled in any of the ways described in last month's issue—foamed-in-place using metering and mixing equipment, sprayed-on, or frothed into a cavity.

On pp. 97-98, end-users will find a basic listing of the various suppliers of urethane foam raw materials, systems, and equipment. Keep in mind that many suppliers of foaming ingredients or equipment can also provide complete package deals, including systems and machinery. But this listing can still be used as a starting point to investigating the field. And judging by the enthusiasm being shown for the materials in so many different quarters, investigation at this time might be well warranted.

Acknowledgments: Thanks are due to many of the suppliers and processors that are listed in the special insert, particularly to Atlas Chemical Industries Inc.; Houdry Process Corp.; Nopco Chemical Co.; Elastomer Chemicals Dept. and Explosives Dept., Du Pont; Mobay Chemical Co.; Pittsburgh Corning Corp.; National Aniline Div., Allied Chemical Corp.; Dow Chemical Co.; and Wyandotte Chemicals Corp. For data on fabric-foam laminations, thanks to: General Foam Corp.; Textilfoam Inc.; Reeves Bros. Inc., Curon Div.; and J. P. Stevens & Co. Inc. Data were also obtained from papers given by J. R. Wall, Inland Mfg. Div., General Motors Corp. (A continuous process for urethane foam prepolymers—A.I.Ch.E. meeting); J. C. Tallman, Du Pont (Foam markets—A.I.Ch.E. meeting); R. C. Darden Jr., Heritage Furniture Co. (Foams for furniture—American Chemical Society meeting); W. C. Bedoit Jr., Jefferson Chemical Co. Inc. (Urethane foams —Houston Market Development Group); and H. W. McNulty and Ray C. Czarnecki, National Aniline Div., Allied Chemical Corp. (Report on urethane markets). Two booklets used as sources are: "Resilient urethane foam"—Elastomer Chemicals Dept., Du Pont, and "The profitable present and the fabulous future of urethane foams," Mobay Chemical Co.—**End**

Heavy-duty packaging

(From pp. 104-105)

safe lane through enemy mine fields. This unit must be rugged enough to withstand towing over rough terrain, and must also act as a shipping container (security prevents disclosure of what equipment the unit contains).

The kit is produced somewhat in the shape of a boat, with three integral compartments, by hand lay-up, using glass cloth-reinforced polyester. It ranges in thickness from ½ to 3 in., and total weight of the plastic part is 900 lb. per unit (gross weight is 3100 lb.). Dimensions are 12 by 4⅔ by 2 ft. deep. Two of the compartments (fore and center) are covered with a reinforced plastics cover. The rear compartment has an aluminum top because of tolerance requirements not economically producible in the RP part.

No information is available on what other constructions were investigated by the Army (this is a new design, and not a replacement part). However, among the reasons cited for the RP specification were freedom from corrosion and fungus, strength superior to that of other materials tested (within given weight requirements), and lower cost of the plastics unit.

Interior packaging parts

Considerable work has also been done at the Dover arsenal on interior packaging components of plastics materials. One of the earliest developments was a molded expandable polystyrene support for shipping primers used in large-caliber artillery ammunition. Formerly, a series of die-cut chipboard supports was used. These required extensive hand labor for proper insertion of the primer at time of packing. Two such series, each holding 24 primers, were packed in a light-gage metal container. Substitution of polystyrene foam supports molded with individual cavities facilitated packaging operations, with resultant cost savings.

A more recent example is the use of high-density PE as a support for the nose end of a complete round of ammunition. Here, the plastic replaces machined wooden or molded asphalt-asbestos supports. The advantages are several: savings in weight, dimensional stability, good retention of properties at temperature extremes, comparable cost by judicious design, and a broader material supply base.

Plastics program is expanding

These are just a few of the examples that point up the material selection revolution going on in the Armed Forces. Other developments involve diverse items such as a filament-wound grommet to protect the soft metal rotating band of artillery shells (see MPl, Oct. 1961, p. 96); barrier materials to protect against water and water vapor, involving PE, polyester, and other films and materials in a variety of laminar constructions; and many more. Undoubtedly, industry will be able to adapt many of the ideas originated by the Army; at the same time, both material suppliers and molders will undoubtedly start going after this market, which has been gradually assuming sizable proportions.—**End**

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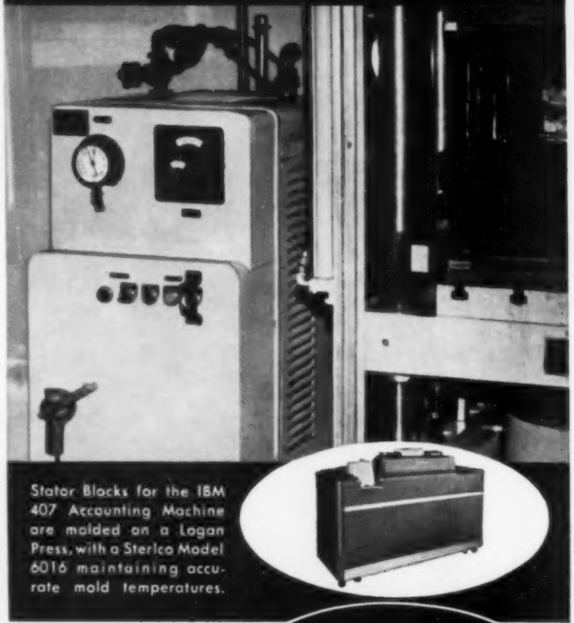

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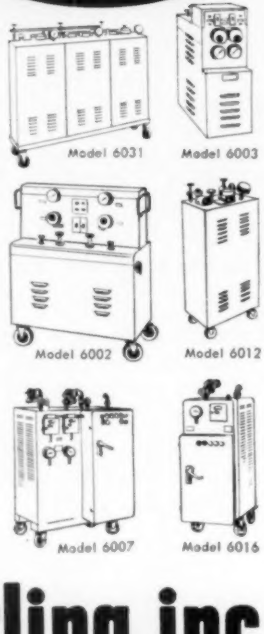

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Manufacturers' Literature

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EQUIPMENT • SUPPLIES • SERVICES

RODS, TUBES, SHEETS. 10-page catalog list prices and other information on nylon rods, electrical spaghetti, nylon pressure tubing, sheet plastics, etc. Carmer Industries, Inc. (101-K)

SLITTING, REWINDING MACHINE. 4-page illustrated catalog folder describes features and applications of machine designed for semi-automatic slitting and rewinding of materials of uneven caliper, coated or tacky surface. Cameron Machine Co. (102-K)

EXTRUDERS. Data file contains many brochures on various types of extruders available, giving pictures, specifications, advantages. Samafor. (103-K)

BLOW MOLDING MACHINERY. 4-page illustrated folder describes automatic blow molding machinery that features fast interchangeability of single and dual die heads. No special mold design requirements; takes all blow mold types. Description, specifications, features. Delamere & Williams Co., Ltd. (104-K)

PUNCH PRESSES. Illustrated catalog covers complete line of heavy duty, power bench-type punch presses. 164 different model combinations—1 to 5 ton capacity. Complete description, specifications, prices, other data. Alva Allen Industries, Punch Press Div. (105-K)

EXTRUDERS. 4-page illustrated folder describes complete line of extruders. Compact construction, finger-tip controls, etc. Complete specifications, main features, other data. Killion Extruders. (106-K)

HYDRAULIC PRESSES. Several brochures describe line of hydraulic presses designed for use in every industry. Applications include: laboratory, research, experimental work, production control, plastic molding (compression), forming, drawing and embossing, plastic sealing (laminating), etc. Pasadena Hydraulics, Inc. (107-K)

PLASTIC WELDER. Illustrated bulletin describes electric plastic welder that welds thermoplastics safely, efficiently, rapidly. For polyethylene, rigid PVC, plasticized vinyl tank linings, etc. General information, specifications, features, other data. Seelye Craftsmen, Inc. (108-K)

VACUUM FORMING. Data sheets with photo attached describe rotary vacuum forming machine, continuous vacuum forming machine, vacuum forming machine, forming and trimming machine. Complete specifications, prices, other data. Brown Machine Co. (109-K)

HEATING TAPE. Illustrated bulletin describes heating tape for the sign industry. Used for heating that portion of an acrylic sheet where a bend is desired. General description, prices, other data. Briscoe Mfg. Co. (110-K)

SLIDE PACKAGE FLANGE FORMER. Illustrated bulletin describing continuous plastic blister flange folder operating from 80 to 400 inches per minute, making 90 or 180 degree edge folds to make re-useable full view slide packages. Tronomatic Corp. (111-K)

STOCK NOZZLES. Specification sheet describes and gives diagrams of stock nozzles, including complete assembly. Contains list of replacement parts and prices. Trubor Manufacturing Co., Inc. (112-K)

CUSTOM MOLDERS. 4-page illustrated folder describes this company's custom molding service for making precision-molded plastics products and components. Products illustrated range from large structural parts to miniature parts for o.e.m. Wayne Plastics Corp. (113-K)

MACHINING & FABRICATION OF NYLON. 4-page folder gives information on machining nylon rod, sheet, and heavy wall tubing manufactured by this company. Includes properties chart. Westlake Plastics Co. (114-K)

CUSTOM MOLDING. 8-page illustrated brochure describes injection molding, sintered plastics, foam molding and vacuum forming activities of this company. Also a description of equipment and facilities and research and engineering services. Hermsdorf Industries, Inc. (115-K)

DESIGN INSERTS. 4-page bulletin with samples describes a pre-printed method of decorating low-pressure fibrous glass molded products. General information, other data. E. F. Twomey Co., Inc. (116-K)

DECORATED MOLDED PARTS. Illustrated sheet describes plants, facilities, processes of manufacturer for producing high quality decorative plastic parts. Finishes include top-surface, and rear-surface vacuum metallizing, silk-screen, etc. Andover Industries, Inc. (117-K)

CHEMICALS FOR PLASTICS. 4 data sheets describe silver conductive adhesives; disintegrators for stripping cured epoxy, polyurethane, polyester and similar compounds; resin for masking or temporary protection of wire leads, lugs, contact points, etc. Isochem Resins Co. (118-K)

INDUSTRIAL FUNGICIDES. Catalog describes complete line of industrial fungicides, including copper, copper 8-quinolinolates, mercurials, zincs, organic fungicides, metallo-organic fungicides, and preservative formulations. Complete information, applications, prices, other data. Nuodex Products Co. (119-K)

POLYSTYRENE. 8-page illustrated booklet describes new self-extinguishing expandable polystyrene that opens many new areas of industrial application. This self-extinguishing polystyrene carries the Underwriters Laboratories approval when foamed to densities of 1.2 to 2.3 lbs. per cu. ft. United Cork Co. (120-K)

POLYPROPYLENE RESIN. 18-page illustrated book gives complete information on polypropylene including properties, processing, cycle times, mold temperature, linear shrinkage, etc. Complete information, chemical resistance charts, etc. Montecatini. (121-K)

LAMINATED PLASTICS. 12-page booklet offers a selection guide to laminated plastics. Discusses high-pressure laminated plastics and their property values, and includes a glossary of terms. Taylor Fibre Corp. (122-K)

SELF-ADHESIVE FOAM. Data sheets with illustrations describe a self-adhesive foam for numerous applications in commercial design, manufacture and packaging. Contains specifications and examples of uses. Air-O-Plastic Corp. (123-K)

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BLENDERS AND VACUUM DRYERS. 12-page catalog illustrates and gives description of a line of blenders and vacuum dryers for both liquid and dry materials. Includes tables of specifications and optional features. Paul O. Abbe, Inc. (125-K)

COLOR COMPARATOR. Information sheet gives detailed information on a "north-light" color comparator which reproduces "natural daylight" and permits accurate color matching at any time. Includes data, specifications and prices. Crown Engineering Sales Co. (126-K)

PANEL SAWS. 4-page brochure illustrates and describes a line of automatic and manual panel saws for cutting large sheets of plywood, plastics, metals, veneer, paper, etc. Includes a list of specifications and other data. Hendrick Mfg. Corp. (127-K)

PRESSURE FORMING MACHINE. Data sheet gives description and specifications of a laboratory pressure forming machine for sampling and development work. Includes illustration and features. The Producto Machine Co., Plastics Machinery Div. (128-K)

AUTOMATIC TURNTABLE. Data sheet illustrates and describes an automatic turntable for use in feeding, packaging and sealing plastic packages. Includes complete data and list of available accessories. Thermo Dielectric Machine Co., Inc. (129-K)

THERMOPLASTIC EQUIPMENT. 16-page booklet describes and illustrates a number of complete thermoplastic systems, including extruders, blow molders and chill roll casting equipment, designed and built to custom requirements. Includes examples of products and special equipment produced by the manufacturer. Modern Plastic Machinery Corp. (130-K)

ROTATIONAL MOLDING MACHINE. 6-page brochure describes a rotational molding machine that utilizes latest materials, both powder and liquid compounds, to make resilient or rigid hollow goods. Available with 15-inch, 25-inch and 75-inch molding area. Includes a detailed engineers report and examples of molded products. The Akron Presform Mold Co. (131-K)

INJECTION MOLDING MACHINES. 10-page brochure gives case histories of the performance of a line of injection molding machines. Includes illustrations showing various applications, plus list of representatives in U. S. and Canada. National Automatic Tool Co., Inc., Plastic Machinery Div. (132-K)

MOLD AND DIE BASES. 26-page brochure illustrates and describes in detail a line of plastic mold and die cast die bases in both standard and custom designs. Includes numerous diagrams and tables of specifications. Columbia Engineering Co. Inc. (133-K)

EXTRUSIONS. 4-page folder describes a plastics extruding service that specializes in standard and custom extruded shapes in addition to other plastic parts finishing. Describes complete technical facilities available and examples of products. Conneaut Rubber and Plastics Co. (134-K)

PLASTIC PIPE. 28-page booklet describes and illustrates a plastic pipe for use in natural gas piping systems. Includes installation techniques and full specifications and data. Naugatuck Chemical Div., U. S. Rubber. (135-K)

"DUSTLESS" COLOR PIGMENTS. 4-page folder describes electronically-controlled plastic-coated "dustless" pigments with choice of 19 standard shades. Includes instructions and handling data. Pleasant Industrial Chemicals, Inc. (136-K)

DAYLIGHT FLUORESCENT PIGMENTS. 2-page bulletin describes two series of daylight fluorescent pigments for mixing with polyester resins. Discusses mixing techniques and offers a sample formulation for best results. Switzer Bros., Inc. (137-K)

ALDEHYDES. 44-page booklet describes the properties and uses of aldehydes, intermediates for synthetic resins, rubber accelerators, etc. Contains comprehensive data on physical properties and other specifications. Union Carbide Chemicals Co. (138-K)

LATICES FOR ADHESIVES. A 16-page manual explains in detail latices for adhesives formulated for bonding a variety of materials both to themselves and to each other, including paper, textiles, leather, metals, plastics, elastomers and sponge. Includes tables of properties and directions. B. F. Goodrich Chemical Co., A Div. of the B. F. Goodrich Co. (139-K)

ADHESIVES. 20-page bulletin describes a line of adhesives and bonding techniques. Includes discussion of tests and other data. Raybestos-Manhattan, Inc., Equipment Sales Div. (140-K)

ADHESIVES, PUTTIES, RESINS, ETC. Information file gives detailed data on structural adhesives, reinforced plastics, laminating materials, molding compounds, putties, resins, coatings in addition to potting and encapsulating compounds. Includes specifications and diagrams. Telecomputing Corp. (141-K)

ABS POLYMER. 8-page brochure describes "Cycolac," an ABS polymer that can be molded, extruded, and vacuum-formed and that has a wide range of product applications. Includes tables of properties and illustrations of end products. Marbon Chemical, Div. of Borg-Warner. (142-K)

RESIN SELECTOR. 4-page folder contains a guide to insulating resins and their uses for potting, encapsulating, and coating electrical and electronic products, parts and assemblies. Includes specifications, data and examples of application. Marblette Corp. (143-K)

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Mold design

(From pp. 109-120)

type steam chamber (no attempt is made to conserve steam in the oversized chamber) and a cooling system which sprays water over the cavity back. This is a very simple type of mold, and no real design characteristics can be taken from this illustration. Heating is done by filling the chest with steam.

The mold in Fig. 2 has a contoured steam chamber. The shape of the steam chamber has been designed to parallel (within reason) the shape of the cavity. In this mold, the amount of steam required to fill the chamber and raise it to preheat temperature is much less than in the box-type chamber. Time is saved at two points in the cycle. First saving is in pre-heat time. Second saving is in the weld, or bead fusion, time. In some cases where a contoured steam chamber is used, the entire cycle is shorter than that required for only the weld time on a mold using a steam chest. Of course, the cost of a contoured steam chamber is greater, but only by the cost of the added casting patterns required. The actual material used costs no more, and sometimes it is much less.

Location of the steam inlet to any type of chamber is important, but more so in the case of contoured steam chambers. Note that the inlets in Fig. 2 have steam baffles; a must in contoured chambers. If the steam impinged directly on the cavity wall, a burn or hot spot could occur. Likewise, if flood cooling is used the water flow pattern must be carefully estimated and flow baffles used if required. In contoured chambers flood cooling may often be used, provided water flows into all sections behind the cavity and core. The geometry of the chamber must insure this occurring.

The decision to use flood or spray cooling is based more on the needs of the part rather than mold design. It depends on whether the item is a long or short run and on whether saving in cycle offsets the great increase in the cost of a spray cooling system. Heating is done by filling the chest with steam.

Another cooling system design is to cast cooling tubes into the cavity walls. Water flows through the tubes during the cooling cycle. Steam can

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also be circulated in the same tubes for mold pre-heat, but it is generally not advisable to use the same tubes for cavity steam injection since drilling into the tubes to make steam ports is a problem, especially if tapered slots are desired.

The use of separate chambers for heating and cooling, sealed off from those used for steam injection, is also becoming more popular. Biggest advantages of this type of mold are that the items are drier and cycles are shorter. Dryness results because no water contacts the beads, and a vacuum is usually pulled on mold sections where steam was injected during the cool cycle. Cycle is decreased because the mold may be filled during the pre-heat of the cycle, the latter being done with chambers isolated from the cavity.

The main point to remember is that, regardless of the type of cooling, all mold sections must cool equally. In general, the advantages of the contoured steam chamber greatly outweigh the disadvantage of slightly increased cost due to the more complex construction.

Assembly of core and cavity to steam chambers

Although assembly of core or cavity of a foam mold to the steam chamber seems simple, several factors must be carefully considered:

The first involves use of dissimilar metals for cavity and steam chamber. Often bronze cavities are assembled to aluminum steam chambers to save weight. When this is done, care must be taken to prevent corrosive electrolytic action between them. This problem is handled as described below and, in addition to molds made of dissimilar metals, the method is recommended for all molds.

In Fig. 2, the joint between the cavity and steam chamber plates is equipped with a gasket. The gasket serves two purposes: 1) it makes the joint water tight, and 2) electrically insulates the two metals. The gasket is made of heat-resistant silicone rubber and is mounted in a milled slot designed to slightly compress the gasket. The mold must be pulled down tight, so slot and gasket must be sized for this requirement. Prior to assembly, a flexible, steam-proof gasket cement is spread thinly on the mating surfaces.

Stainless steel bolts **(To page 213)**

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are used for mold assembly. The temperature cycling plus corrosion problems make stainless bolts a must. Ordinary steel bolts will disintegrate upon removal after a long run. Also socket-head bolts should be avoided. These cannot take the force needed to loosen them when needed. Another reason for stainless bolts is that they, in conjunction with the gasket, help prevent corrosive electrolytic action.

Care must also be used in assembly so that when all bolts are tightened, mating and mounting faces are true and undistorted, else the mold will not operate properly. This is most critical not when the mold is under pressure, but during mold filling, when no pressure is being exerted on the mold closing faces. Improper alignment of mold lands will cause gap variations and may cause filling problems.

Mold closing faces

In PS foam molds, mold lands, or closing surfaces, must be designed according to the type of machine and cycle characteristics. For example, when vacuum is used to fill the mold, lands must seal the mold against atmospheric pressure; on the other hand, when air pressure is used to fill, the mold does not require a seal—in fact, the mold is purposely left open. (However, it may be necessary to seal the mold later in the cycle). Also mold lands are sometimes designed with venting, to allow condensate to escape between closed faces. In any case, it is necessary for mold lands to be hardened so that beads accidentally trapped between lands will not damage the surfaces.

As previously stated, it is sometimes necessary that air escape from the partly open molds. Figs. 8, 9, and 10, which are shown on p. 117, show three types of mold lands. Fig. 8 is for a simple type of box mold in which clamp pressure on the land is transmitted directly to the mounting. This design is weak because land area and width is too great to allow free air escape from the mold.

In Fig. 9, the land parallel to the back of the mold has had its area reduced for free air flow and the clamp force is exerted on auxiliary support pillars or blocks. These blocks are located around the periphery of the mold and prevent the distortion of the mold as well as the lands.

The mold seal in Fig. 10 has no lands. Instead, the core is tapered and slides partly into the cavity. When the mold is cracked, the taper allows air to escape through a gap of about 8 to 10 mils around the core. This will allow escape of air, but not of beads. When the mold is closed tight, this gap is reduced to about 2 mils. The rounded edge on the cavity does not require a sharp edge to be put on the lip of the cavity. And use of the rounded edge also contributes strength to the mold cavity.

Another advantage in this design is that if the edge of the molded part must be of heavier density than the rest, the gap can be varied by any amount up to ¼ in.; the edge may then be compressed by closing the mold. However, this will only work on articles having a relatively thin cross-section.

Ejection

One of the most difficult foam mold design problems is automatic injection. The industry uses ma-

chines with both vertical- and horizontal-acting clamps. Each require different ejection systems. On vertical machines, automation requires moldings to adhere to the top force until ejection onto a tray for removal from the press. In horizontal machines, the moldings can be ejected from either mold half to fall vertically between the molds on to a conveyor system for removal from the molding machine while the next cycle begins.

There appear to be few problems. However, ejection system design is often complex.

First complication is the softness of the foam article at the end of the cycle. If not ejected squarely it sticks easily, and ejector pins punch holes in the product. The only really good solution is to use both air and mechanical ejection in various combinations. While it is beyond the scope of this article to discuss all possibilities, a few words on the types of ejector pins to be used is in order.

The pins should have as large a head area as possible and should have a back taper so that as beads expand they will not seep down the side of the pins, but rather will seal the pins hard against their conical seats. (See Fig. 11, p. 120.) Pins passing through the steam chamber must also ride in sealed water-tight bushings. If several pins are used, all must be linked mechanically to eject simultaneously. Pins should not be activated individually. If some of the part sticks, the other pins will puncture and deface the molding area.

When air ejection is used alone or to assist mechanical ejection, two points should be borne in mind. First, if air is blown through a contoured steam chamber to make use of steam ports for ejection, the ports will direct the air uniformly toward the parting line of the mold, thus ejecting the piece. But in a square steam chest mold, the air will act on all part areas at once and may interfere with the injection cycle.

Location of steam ports should be designed to promote proper ejection. Second, remember that air only pushes most articles just out of the mold, and that unless other means are employed, parts can float there like an airfoil.

The best method of using air is to assist mechanical ejectors, so that as the pin advances an air blast is released simultaneously. This usually brings a molding quickly out of the cavity.

Mold mounts

Presses with three different types of mold clamping "platens" are currently available. There are simple compression presses equipped with solid clamp platens; presses with hollow platens, which are really steam chests to which the cavity and core plates are attached; and presses in which the platens consist of adjustable bars forming a grid or matrix system in which the molds are mounted.

The solid platen press will accommodate either square chest or contoured chamber type of mold. In the box mold, the bottom plate of the steam chest is simply fastened with mounting flanges to the solid platens. The walls of the steam chest carry the clamping force and should be sturdy enough to with-

stand the compressive forces. Be sure the mounting flanges are designed so that the compressive clamp force is distributed uniformly through the mold structure to prevent distortion in the clamped mold. Thin-wall sections may crumple under the clamp force.

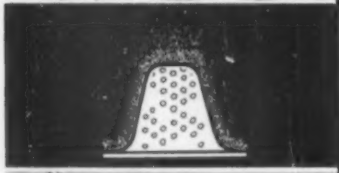
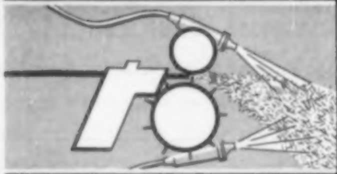
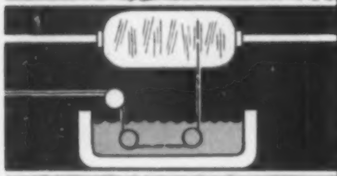
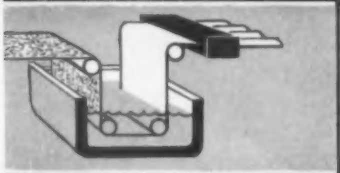
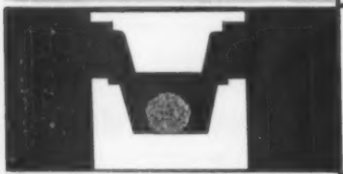
In addition, since solid platens are an excellent heat sink, the bottom of the steam chest should be thermally insulated from the platen. This is usually done by placing insulating material between mold and platen. Take care to provide sufficient bearing surface area so that the clamp force will not crush the insulation or the mold. Also make the lugs sturdy enough to keep the mold rigidly fixed to the platens when the mold is opened. Opening forces often exceed dead load and closing forces.

When contoured molds are used on solid platens, the mold is usually mounted on pillars or blocks supporting the periphery of the mold. Ribs or blocks may also be used under the steam chamber proper to prevent distortion of the chamber and cavity by steam and foam expansion pressures. Usually the contoured walls of the steam chamber will not carry the clamp forces, these being absorbed by the mold flanges.

In the press where the platens are steam chests, the problems of mounting the core and cavity plates are similar to those discussed under the section dealing with the assembly of core and cavity platens to steam chambers.

In the grid- or matrix-type of platen, the mold is mounted by clamping the periphery of the mold flanges forming the parting line of the mold. Normally, this mold mounting system allows the use of deep-draw molds, since much of the mold may project through the grid or "platens." In addition, less consideration is given to using heavy metal mold sections, since there is no clamp force load on the cavity or steam chamber plates; all of the load is carried by the solid metal flanges. Steam, water, air, and other connections are also simplified, since the entire rear side of the mold is exposed. Normally, it is wise to add ribs to the unsupported sections of the mold for rigidity to withstand steam and expansion pressures.—**End of Part I**

J-M Fiber Glass:
MATCHED TO METHOD

	Molding Method or Application
	**HAND LAY-UP**
	**PREFORM**
	**SPRAY-UP**
	**FILAMENT WINDING**
	**CONTINUOUS MOLDING**
	**PREMIX MOLDING**
	**POTTING, ENCAPSULATING and PUTTIES**

Blow-up ratio

(From pp. 123-126)

index resins, as shown in Fig. 7, p. 126.

From data observed in both sets of experiments, the constant haul-off rate series and the constant screw speed series, the conclusion may be drawn that increasing blow-up ratio for all resins listed in Table I will tend to balance orientation. The effect of balanced orientation is noticed in strength properties between machine and transverse direction, and an increase in impact strength of the film.

An attempt was made to analyze the effect of blow-up ratio on Elmendorf tear strength in the machine and transverse directions for all 27 runs in each series of experiments. The results of this analysis only further confirms the opinion frequently expressed in the blown film industry that Elmendorf tear is a poor measuring device for the tear propagation properties of PE film. The complex interactions of melt index, density, haul-off rate, and blow-up ratio cannot be sorted for presentation in a straightforward manner. Fig. 8, p. 126, is an attempt to show the effects of resin density on machine direction Elmendorf tear strength at 1.5:1 and 3.5:1 blow-up ratio for film made at constant haul-off rate and for film made at constant screw speed. The parabolic curve for the 1.5:1 blow-up ratio prevents making a conclusion about the effect of blow-up ratio on Elmendorf tear.

Fig. 9, below, presents the effect of blow-up ratio on machine direction Elmendorf tear strength for film made from resins of 0.916 and 0.929 g./cc. density. Increasing

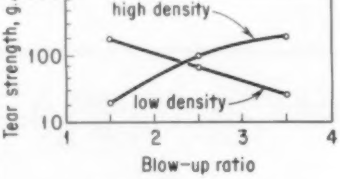


FIG. 9: Elmendorf tear strength of blown PE film in the machine direction as a function of blow-up ratio using high and low density resins made under constant haul-off rate conditions.

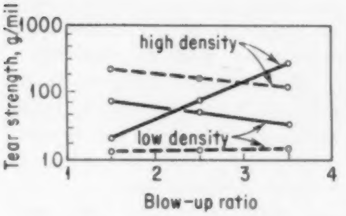


FIG. 10: Elmendorf tear strength of blown polyethylene film in the transverse direction as a function of blow-up ratio using high and low density resins of two different melt indices extruded under constant haul-off rate conditions. Solid curves are data for low melt index resin; dashed curves are for high melt index.

blow-up ratio improved machine direction Elmendorf tear of the higher-density PE films, but decreased tear strength of the lower-density films. The picture on transverse direction tear strength is even more complex because melt index appears to play an important role in determining the effects of blow-up ratio. Figure 10, above, shows the average transverse direction tear strength for the lower and higher-melt-index resins. The effect of blow-up ratio on transverse direction tear of the resins of lower melt index is opposite to the effect on those of higher melt index. Such complex relationships leave doubts as to the validity of the Elmendorf test which has 95% confidence limits of experimental error of ± 52 to 75% for machine direction Elmendorf and a range of from ± 36 to 95% for transverse direction Elmendorf.

In conjunction with these experiments on blow-up ratio with the series of resins in Table I, another series of experiments was run to determine the effects of blow-up ratio on five resins from four other PE suppliers (3). The resins selected all had about the same melt index and density, and are all used as general-purpose blown film resins in the industry. Optical properties and dart drop impact strength for these resins extruded at the suppliers' recommended conditions and blow-up ratios of 1.5, 2.5, and 3.5 are presented in Table II, p. 124. From the data in these tables, it can be concluded that increasing blow-up ratio over the range studied has

essentially the same beneficial effect on properties of film model made from resins of all PE producers.

The statistical analysis of the data generated from these experiments permits some very clear-cut conclusions. Over the range of blow-up ratios studied:

1. Haze, gloss, and light transmittance, are improved as blow-up ratio is increased.

2. Strength properties, such as ultimate tensile strength and elongation become more balanced in the machine and transverse directions as blow-up ratio is increased.

3. Dart drop impact strength of blown film increases as blow-up ratio is increased.

4. The effect of changes in blow-up ratio is essentially the same for films made of any polyethylene resin, including those of low and high melt index, with density from 0.916 to 0.929 g./cc., and for resins from any supplier.

This information indicates that the producers of PE film should give careful consideration to die sizes when selecting machinery for new blown film installations or when remodeling old lines. From the standpoint of producing the best all-around film properties, a range of blow-up ratio from 2 to 3 is recommended. If a production line is designed to produce a large amount of 14-in. lay-flat tubing, and the choice must be made among dies of 4-, 6-, or 8-in. diameter, common sizes in the industry, the following formulas should be used to determine the optimum die size for maximum blow-up ratio:

$$\text{Blow-up ratio} = \frac{2 \times \text{film width}}{\pi \times \text{die diameter}}$$

It is seen that the 8-in. die will produce film at a blow-up ratio of 1.1; the 6-in. die at 1.5, and the 4-in. die at 2.25. In such a case, this work would indicate the purchase of the least expensive, 4-in.-diameter die to permit operation at a 2.25 blow-up ratio for the best optical and strength properties.

References

1. Huck and Clegg, SPE Technical Papers, Vol. VII, 1961.

2. G. D. Murphy, SPE Technical Papers, Vol. VII, 1961.

3. L. A. Kuhlmann, Unpublished U.S.I. Polymer Service Laboratories Report.—**End**

High-density PE

(From pp. 131-136)

20° K., is responsible for usage in pumps to handle liquid hydrogen. Some pumps have used piston rings cut from a sheet of material (12) to eliminate metal seizing. Machined valves, cocks, and check valve balls are related uses under development. Cut sheets of the material have been suggested as packing for bubble chambers.

Prosthetics: The lightness, strength, and insulating power of the material make it admirably suited for the manufacture of artificial limbs.

Filters: Used as plates and lining for filters handling hydrochloric acid, this material is still in service after 1 year in 35% HCl at 80° C., and, in a special form, as a porous filter mat.

Doubtless many other uses, involving resistance to repeated shock, will be found for Hi-fax 1900. These might include gunstocks and handles for pneumatic machinery, chopping blocks, stops of all kinds, gears for shock loading, shoe lasts and filler rods, and chain guides. Sheets of the material, suitably stabilized for weather resistance, should make ideal stock for the fabrication of buoys and channel markers. Its possibilities in housing for electrical switchgear and breaker boxes remain unexplored at the present time.

The development of the rapid fabrication techniques needed to bring these possibilities into reality is a challenge to industry.

Acknowledgment

It is a pleasure to acknowledge the cooperation of the pilot plant group at Hercules' Parlin, N. J. Plant, of Messrs. E. C. Wenger, P. Erickson, F. Nakielny, and H. Moyses at that location, and of Messrs. G. B. Feild, M. Wirick, and E. J. Witter at the Hercules Research Center for making the materials and doing the test work reported here.

References

1. K. Ziegler *et al.*, Angew. Chem. *67*, 424-26 (1955).
2. R. Chiang; see P. F. Francis, R. C. Cooke Jr., and J. H. Elliott, Journal of Polymer Science *31*, 453 (1958).
3. J. H. Elliott, personal communication.
4. ASTM Designation D 1238-57T.
5. E. B. Bagley *et al.*, J. Appl. Physics *28*, 624-7 (May 1957); J. Appl. Physics *29*, 109-10 (Jan. 1958); J. Appl. Physics *29*, 1511-12 (Oct. 1958).
6. O. Roelen, French Pat. 1,-186,391; Canadian Pat. 580,069 and 580,101; Belgian Pat. 558,103. Bulletin "Hostalen GUR," Farbwerke Hoechst, Oct. 1960.
7. ASTM Designation D 256-56.
8. ASTM Designation D 1044-56.
9. ASTM Designation D 785-51.
10. Private communication from Dr. Linhardt, Farbwerke Hoechst, Mar. 19, 1959.
11. Private communication, Drs. Becker and Spiske, Farbwerke Hoechst A. G.
12. H. Bridge, R. Budde *et al.*, "Advances in Vacuum Systems and Technology," Vol. II. Pergamon, New York, 1960, p. 481.—**End**

Glass Microballoons

(From pp. 141-150)

tor are substantially reduced. It is possible to incorporate metal flake in these formulations and raise the dielectric constant while keeping the weight low. These dielectrics can be produced with closely regulated properties over a wide dielectric constant range (7).

We have considered the use of hollow glass particles as a bulk filler for four plastics: polyester, phenolic, epoxy, and PVC plastisol. These particles are equal to or better than conventional fillers when compared on a true volume-% basis. Much less dense articles are possible with this product than with any material available. In addition to the four plastics, hollow glass particles work well as a bulk filler for other types of materials, such as acrylics and silicones.

Glass Microballoon particles will not work in applications where high pressures or high shear rates are involved, such as in extrusion or injection molding. In these cases the particles are broken because of either the high shear rates or the high pressures in the fabrication. However, this new product does work extremely well in applications where molding pressures are relatively low. Articles have been successfully molded from compositions containing hollow spheres at pressures to about 200 p.s.i. and the particles should survive intact at pressures to 500 p.s.i.

References

1. Modern Plastics Encyclopedia, 1956, p. 303.

2. J. B. Crenshaw, Modern Plastics *34*, 133 (Aug. 1957).

3. W. O. Erickson and W. R. Ahrberg, Modern Plastics *33*, 125 (Nov. 1955).

4. R. F. Shannon and L. P. Biefeld, Ibid, 133.

5. G. P. Larson, Modern Plastics *35*, 157 (May 1958).

6. J. Delmonte, Aggregate Reinforcements for Cast Epoxies, S.P.I. Meeting, Chicago, Ill., Feb. 5-7, 1957.

7. W. R. Cuming, H. E. Alford, and F. Veatch, "Glass Microballoon Spheres," SPE Technical Papers, Vol. V, 15th Annual Technical Conference, Jan. 27-30, 1959, Paper No. 74.—**End**

Methyl glucoside

(From page 151)

glucosides can be crosslinked with a diisocyanate, such as toluene diisocyanate. The extent of crosslinking can be varied to give flexible to rigid foams by controlling the molecular weight (and hence hydroxyl numbers) of the polyethers. The exceptional crosslinking efficiency of methyl glucoside polyethers having a high hydroxyl number is particularly advantageous in the preparation of rigid foams and, of course, results from their high functionality.

Foams were made by the following typical procedure. For a rigid foam 1 part of lecithin and 1 part of N-ethylmorpholine were thoroughly mixed until a clear solution was obtained. In the following order 0.2 part of water and 6 parts of polyoxyethylene methyl glucoside of hydroxyl number 480 were introduced into the solution with adequate mixing after each addition. Six parts of toluene diisocyanate were then added. After stirring for approximately 30 sec., the reaction mixture was poured into a waxed beaker and allowed to foam at room temperature. The beaker was removed after 30 min. and the foam cured for 2 hr. at 70° C. The rigid foam was light yellow and had a density of 11.74 lb./cu. ft. Its compressive strength was 436 p.s.i. at a 50% compressive deflection. Under the right conditions rigid foams in many densities may be obtained by reacting polyoxyethylene methyl glucoside with diisocyanate.

By using essentially the same procedure, a semirigid foam was prepared from the polyether of hydroxyl number 137 and a flexible one from hydroxyl number 76.

This preliminary work on urethane foams prepared by reaction of polyoxyethylene methyl glucoside with toluene diisocyanate has shown the potential utility of methyl glucoside derived from corn starch as a raw material in this greatly expanding field. A detailed investigation of polyethers prepared from methyl glucoside by reaction with ethylene oxide, propylene oxide, or mixtures of the two epoxides should establish a place for these potentially low-cost products, not only in the urethane foam industry, but also in urethane coatings and adhesives.—**End**

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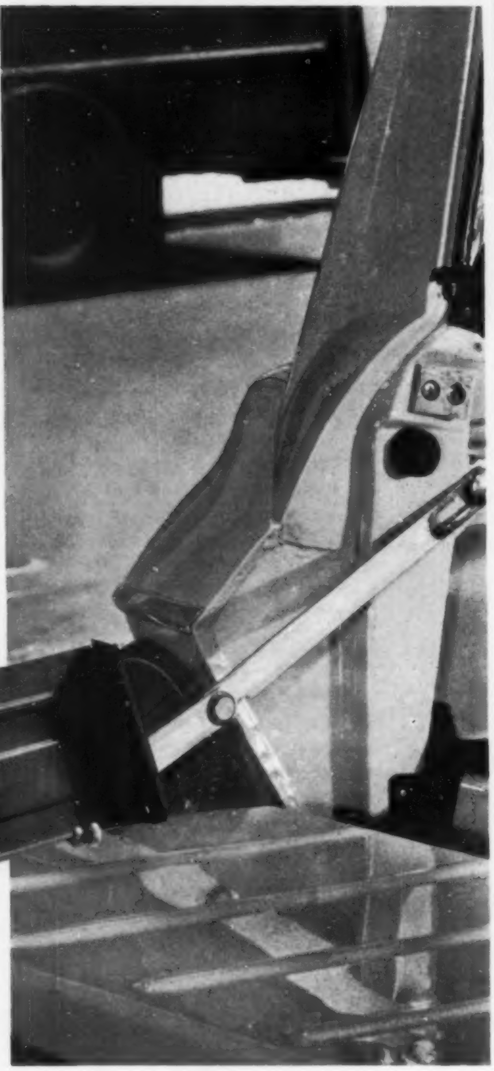


LOOK AT THESE TEST VALUES:

	DPD-7070	DMD-7002
Density, gm/cc	0.945	0.950
Melt Index, gm/10 min.	8.0	7.5
Secant Modulus, psi (stiffness)	70,000	100,000
Flex Life, Flexes to Fail 55 mil Thick Specimen	14,000	14,000
Brittle temp., °C (D746)	−100	−95
[1]Low Temp. Brittleness, °C	−30	(Rm. Temp.)
[2]Room Temp. Toughness, ft.	d.n.b.	5

[1]Min. temp. at which injection molded dishpans (stock 450° F) are good when a 10-lb. rod at 3 ft. height is dropped on dishpan sprue.

[2]Maximum height from which a 5-lb. rod can be dropped on the sprue of injection molded dishpans without damage to the dishpan. "d.n.b." indicates that the material does not break at room temperature.

THE PLASTISCOPE*

Important news . . . and what it means

By R. L. Van Boskirk

Section 2 *(Section 1 starts on p. 41)*

November 1961

Flexible methacrylate sheeting

New, thin, oriented, colorless, and transparent methacrylate sheeting less than 3/32-in. thick is being offered by Rohm & Haas, Philadelphia, Pa. Other oriented sheet has been made by Swedlow; Goodyear's Aeronautics Div.; General Plastics of Tacoma; and Douglas Aircraft, but this is primarily for airplane windows where it is used because of its resistance to rupture and crazing. It is made from a different formulation and is produced only in thicker sections.

The new material, called Tuffak, is semi-flexible and is said to have excellent craze resistance—a nail can be driven through it without causing a crack. Its thickness is from 0.030 to 0.080 inch. It is an oriented sheet and, consequently, is not suitable for thermoforming with oven or infra-red heating, since heat will cause it to return to its original size. It is said to withstand 180° F., however, before it starts to shrink back to its original dimensions. But it can be strip-heated in a narrow area successfully. It is available in 84- by 84-in. size and can be easily cut to desired sizes or shapes. Rohm & Haas may make it available in color if a demand should develop. Introductory price is 65¢/sq. foot.

Some of the suggested uses for this product are: Motorcycle windshields; areas where curved glass is now used, such as show cases or the old familiar chinaware cabinets; stamped parts like windows used on instruments, where visibility is necessary; glazing of industrial buildings, greenhouses, and cold frames; windows in poultry houses; patio shelters; partitions in greenhouses to separate varying temperature areas; and trailer windows. One current use is windows for house trailers. One man has used it over openings in a portable fishing shelter.

An interesting possibility is for rear windows in convertible automobiles. It is stiffer than presently used polyvinyl chloride, and not quite as flexible; however, Tuffak will not discolor or deteriorate on prolonged exposure to the elements, according to a Rohm & Haas spokesman.

Of course, the business of finding markings for this thin, clear MM sheet is just as difficult as introducing a brand new product, since no one is experienced in its use. Rohm & Haas development technicians assert that they are not sure where it will eventually find useful application, but believe that it will prove practical in a wide range of uses. They are hopeful that distributors of Plexiglas acrylic sheet will find many applications for Tuffak developing among their more imaginative customers.

A new pattern in integration?

Spencer Chemical's adventures in integration, particularly as it applies to plastics, are taking a bit different tack than the more common custom of buying into a large consumer of the company's product. Although the parent company is diversifying into various fields from its original position in ammonia and fertilizer production, integration of its plastics operations is a rather daring venture into a closer relationship with the ultimate consumer.

There are all sorts of variations in plastics integration. Producers of vinyl chloride resin often have set-ups which go all the way from monomer to film or sheet for shower curtains, table cloths, window curtains, etc. Some of them have integrated upward rather than downward—thus calenderers became resin producers instead of buyers and more or less up-ended the industry when they started selling surplus resin at so-called "shaved" prices. This situation applies much more to calenderers than to extruders or molders of vinyls. Many vinyl producers are integrated but they are not yet diversified.

In polyethylene most of the producers are integrated—that is they own an interest in large-volume extruded film organizations. The film mostly is sold directly to users as well as to converters for printing, bag making, etc. "User" in this case means garment bag manufacturer, food packer, etc. The industry is still waiting for an early decision to see if Union Carbide will appeal the FTC Visking decision, which may help to determine the extent of this trend in that industry.

The phenolic industry has operated for a long time with a great captive market, but it is much more prevalent in the laminating and other liquid-type formulations than in molding. The American Cyanamid-Formica combination is an example of a producer supplying a high-pressure laminating subsidiary with resin (melamine); in this case, the finished decorative laminate is sold primarily to fabricators of counter equipment, furniture manufacturers, and distributors rather than directly to the final user of the plastics.

The situation in polystyrene is more complicated. Here there have been many companies that started as molders and integrated upward by building resin plants. Foster Grant is one example. Rexall, a drugstore chain with various affiliated manufacturing projects that helped supply its retail outlets built the Seamco resin plant to supply its affiliate, Seamless Rubber, with molding resin. Then Rexall branched out by acquiring three polyethylene processors — Tupper, Chippewa, and IMCO, a molder, a film processor, and a bottle maker, respectively—before building a PE plant. On the other hand, Dow Chemical is now operating a large-scale facility around other processing plants to make containers for food processors—about as close to the retailer as one can get without operating a store.

This brief outline indicates many of these operations are in indirect contact with the ultimate consumer, but, even so, not too many are actually selling at retail outlets, except as containers or parts of finished goods.

There are, of course, some direct retail outlets that are managed by plastics producers.

The rubber companies who make vinyl chloride operate retail outlets, but they emphasize mostly tires and automotive supplies rather than vinyl chloride finished products. Then there are widely advertised items such as flashlights, anti-freeze, paints, etc., manufactured by chemical companies and sold directly to the ultimate consumer through retailers or even in the company's own retail outlets. But this is still integration rather than diversification. It is not diversification in the same sense as employed by a company like Textron, which makes and sells a myriad of products that have no relationship to each other. Most

*Reg. U.S. Pat. Off.

THE PLASTISCOPE

(From page 228)

of the so-called diversification by chemical companies such as Union Carbide or Du Pont is basically tied to chemicals or an offshoot thereof, such as textiles or metals.

The out and out diversifiers now in plastics are mostly companies which came in during the 1950's after starting in other fields when attracted by the plastics industry's potential growth. These are companies like W. R. Grace and Rexall, although the former did have a good-sized chemical operation before it entered into polyethylene. The petroleum companies are more or less integraters because of their petrochemical supply lines. But the chemical companies have long coveted a closer relationship to the retail consumer market and the trend is intensifiying, although there have been enough "busts" in past history to make them cautious. They may feel that it gives them better assurance of a guaranteed performance when a product reaches the consumer; gives a large customer assurance that his supply line is secure; prevents loss sustained when customers, for example, switch to other resin suppliers who may cut prices. Two significant moves in this raw material-end user integration in 1961 were Dow's establishment of its container fabricating operation and Du Pont's manufacture of Delrin pipe.

All this may seem like merely a discourse on semantics but, nevertheless, industrial integration has become extremely important to the plastics industry at all levels, since it has become such a large-volume part of American industry. An individual plastics firm or even a big company about to enter the movement must look sharply at the type and volume of business and the organizations confronting him. If he moves blindly, be he small or large, he is foredoomed to failure.

The Spencer expansion over the past few years is a little different from others—a combination of integration and diversification. In the purchase of three comparatively small flexible packaging firms whose technical and market areas do *not* overlap to any extent, Spencer has leapfrogged the PE extruded film line, although the company recently bought controlling interest in a film extruding operation in Ecuador. Thus the company can say it is *not* competing with extruders in this country—in fact it is in the rather unique and advantageous position of a producer of raw material who buys film. The total sales of Spencer's three packaging companies before acquisition was probably around $5 million annually. The two New York companies that make and design packages have already been combined. Since there are not many large independent film extruders available, Spencer, by going into packaging, took another tack—a challenging answer to most of their competitors who own film producing plants. These firms could buy more and enlarge their packaging facilities if they wish to expand further. Spencer, too, is eager for national business, and accumulation of small plants could help toward this. Meanwhile the parent company is acquiring first-hand knowledge and technical service from the converter's point of view to help in its own laboratory research.

But this was only part of the Spencer move in its expansion development. The company recently entered the glue business by acquiring Perkins Glue Co., manufacturer of glues used primarily in furniture, plywood, and chipboard. Perkins, established in 1899, is a pioneer in "vegetable glues" that helped kill the market for horse hooves. Its plants are in Lansdale, Pa.; Shawano, Wis.; High Point, N. C.; West Memphis, Ark.; Alexandria, La.; and Kitchener, Ontario, Canada. All of them are in close proximity to customers. Perkins sales approximate $5 million a year.

Spencer produces formaldehyde and urea which can be used in urea and phenolic glues; but, apparently, is not presently contemplating entry into this field, since it would have to compete with its present formaldehyde customers. Spencer considers its acquisition of Perkins Glue as diversification rather than integration.

Spencer acquired Pittsburgh & Midway Coal Mining Co. a little over a year ago. Its mines are located in Kentucky, Missouri, Kansas, Arkansas, Colorado, and New Mexico. Net sales of coal in the past year, most of it to industrial consumers and producers of electrical power, were over $16 million and represented 21% of Spencer's total net sales. This is definitely diversification.

Agricultural chemicals, Spencer's basic product, totaled over $31 million last year and represented 39% of total net sales. Industrial chemicals, which include methanol, formaldehyde, ammonia, ammonium nitrate for blasting. Argon and carbon dioxide gas products and nuclear fuels netted almost $12 million or 15% of total net sales.

The company includes Poly-Em in industrial chemicals. It is a brand-new polyethylene emulsion used in polish, textiles, and paper industries. A new 20-million-lb. plant in Chicago will begin production in 1962. Spencer is not interested in producing polishes or waxes, but would like to sell Poly-Em to companies that are.

Latest move in Spencer's multiple expansion is a spanking new plastics laboratory at its PE plant in Orange, Texas. The company went in strong for laboratory research about the time it entered plastics, and built a new lab near Kansas City that was the pride and joy of the late president, Kenneth Spencer. At least two of the company's new products, the above mentioned Poly-Em and a new PE copolymer, Poly-Eze, were developments of intensified Spencer research. The company's plastics raw materials are PE and nylon 6, but it also sells polypropylene obtained from Enjay. Sales of plastics were $19.6 million last year, or 25% of total net sales. Total number of pounds was a substantial increase over the year before, but resin price declines cut down on the company's profit.

Rector has new formulation

Among the first of the new products announced by the newly organized Rector Engineering & Plastics Co., Washington, D. C., is a technical adhesive designated Castabond #121, which is suggested for use with "problem materials" such as rigid or unplasticized PVC. It is supplied as a low-viscosity liquid and cures without baking and under contact pressure after a liquid hardener, #J, has been added. Rector specializes in sealing and insulating compounds that are sold to the electronics, heavy equipment, and maritime industries.

Amorphous PP on sale

When polypropylene (PP) is polymerized there is always a certain portion of amorphous material in contrast to the ordered regularity of the PP polymer. It is a sticky, gummy "goo" for which a big use has never been found. Before Prof. Giulio Natta announced polymerization of PP by a stereospecific process, PP had been polymerized by other methods—but there was always so much amorphous material that commercial production was impractical. Natta's success was in holding down the amorphous content, which he called atactic, to 15% or less. There is always a small percentage of this amorphous material in commercial PP today,

(From page 230)

otherwise it would be too crystalline for practical use. Eastman Chemical is offering this straight amorphous material in 7-lb. samples. Other companies will not tell what percentage of their production is amorphous but admit that there is enough to cause them to hunt for applications. They haven't found many uses as yet. One company says the best use is "burn it." However, it is compatible with many resins, is sticky, stretches and melts easily, and is suggested for use in hot-melt adhesive blends used in sealing, caulking, and potting, or in waxes to impart flexibility.

PE for garment bags

Two new polyethylene formulations expressly tailored for use in extrusion of film for garment bags are now available from Eastman Chemical Products Inc. The new materials, designated Tenite PE 2901F-Natural and 2904F-Natural, are said to produce film that has high-slip characteristics as well as exceptional toughness and clarity.

Derived from the same base, both formulations have a nominal melt index of 7.0 and a density of 0.926. Each of these materials, according to Eastman, is processable at fast production speeds, has excellent drawdown characteristics, and high uniformity in quality. Film can be extruded in thicknesses as low as 0.4 mils without die tear-off. The company states that garment bags made from the extruded film open easily and slide smoothly over all types of garments.

New PE coating formulation

A new polyethylene formulation which is said to produce glossy coatings having a low coefficient of friction is now available from Eastman Chemical Products Inc. Designated Tenite Polyethylene 1H55P Natural, the new formulation contains a special slip additive capable of withstanding the high (up to 600° F.) melt temperature that is required in extrusion coating.

The new formulation is also said to have uniform drawdown, low neck-in, low edge variation, and good adhesion. It has a nominal melt index of 3.5 and a nominal density of 0.921. In laboratory tests, the company claims, the minimum sealing temperature of 1-mil coatings on 40-lb. kraft paper was approximately 300° F. Sealing range is wide and the seam strength is described by Eastman as very good.

The high slip afforded by the new formulation is especially advantageous for coated paper that is to be fabricated into glossy cartons and pouches on the high-speed packaging machinery now being used.

Polystyrene cups for vending machine

The trend of paper companies entering into the plastics business was again emphasized at the recent dedication of Scott Paper Co.'s magnificent new executive offices, research and engineering center on a 47-acre tract adjacent to Philadelphia International Airport.

An interesting feature of the dedication pertaining to plastics was Pres. Thomas B. McCabe's preliminary interview with the press before the ceremonies began. There seemed to be about as many reporters from chemical papers at this conference as there were from the paper publications or the local newspapers. When asked what new products the company had or was about to produce, Mr. McCabe listed several paper products—but reporters' ears seemed to perk up much more alertly when someone asked him: "What are you doing in plastics?" Mr. McCabe didn't go into details, but did mention polyurethane foam for inner lining in apparel and polystyrene cups, with picnic plates and table mats as possibilities. He said that the company is investing about $3 million for additional production facilities to manufacture flexible foam, polyester type.

The Scott cup (primarily for vending machines but which could very well be used in in-plant feeding or even in the home for hot and cold drinks) is an interesting development. Not many details are available on how it is made, except that it is a laminate of PS foam and film entirely produced and formed on Scott-built machinery. Each cup weighs about 6.12 grams—22 lb. of PS will make 1500 cups that can be used for either hot or cold drinks. Even boiling water is said not to distort a Scott-made cup while in use. It is insulated so precisely that it can be held in the hand without burning and yet it has a warm feel so that the user is not likely to burn his lips or tongue—unlike the first foam cup made in this country, which was so well insulated that the user was not always aware of the intense heat. Furthermore, this first cup couldn't be stacked or dispensed through automatic vending machines. The Scott cup also gives off no plastic aroma, which is a complaint sometimes leveled at plastic cups.

The various types of plastic cups are listed in the accompanying table. Vending machine cups can't be over 0.020 in. thick, and should be nested 75 to a stack or about 20 inches from top to bottom. It has been estimated that cups used in vending machines represent $28 to $30 million a year in revenue to the cup manufacturing industry. Canteen Co. of America has been reported as distributing 75 million all-plastic hot cups to its machines in the first half of 1961. The same cups will eventually be used in in-plant feeding, and caterers who are now using paper cups with handles are also interested. The total market for all (To page 236)

Plastic cups for hot or cold drinks in vending machines

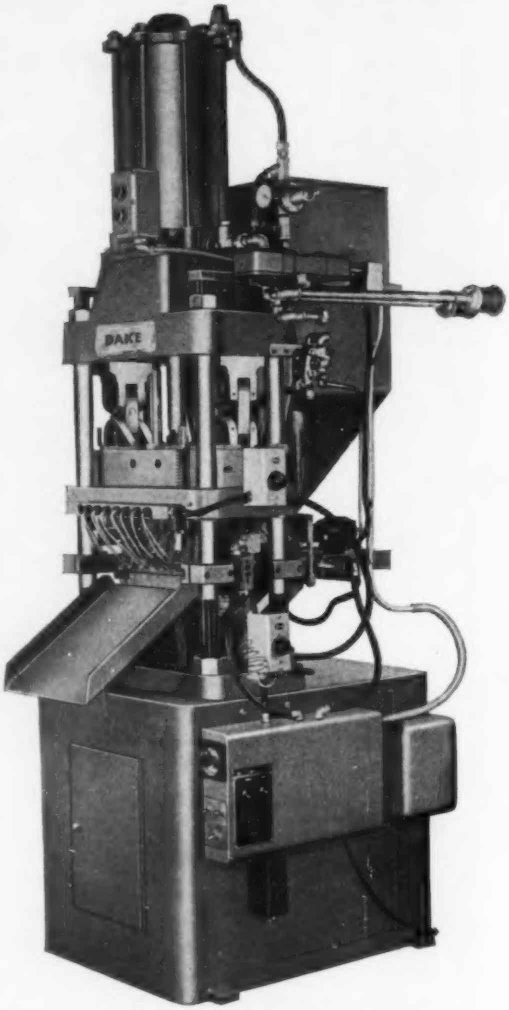
Producing company	*Type*	*Base price 1000 cups*
Scott Paper Co.	2-ply foam and sheet laminate PS (all plastic)	$9.40
Lily-Tulip Cup Corp.	H. W. paper, spray coated	8.69
	L. W. paper, spray coated	8.24
	Paper with low-density PS foam liner	9.97
Dixie Cup Div., American Can Co.	H. W. paper with PE laminate	8.69
	L. W. paper with PE laminate	8.24
	Experimental—PS foam band around middle of paper cup	——
Conex Div., Illinois Tool–Dow	Polystyrene molded	8.45
	Also a single-wall translucent cold cup	——
Scoop (Canteen Corp. of America for its own machines)	Polystyrene molded	8.40

Figures given in this table concern largest vending cup producers; there are also several other rather large-scale producers, such as Maryland Cup Corp. of Baltimore and Continental Can Co., Bondware Div.

Announcing the new...

DAKE "49 SERIES"

LOWEST-PRICED HIGH-SPEED AUTOMATIC MOLDING PRESSES



Model 49-050
(50 tons capacity)

The new 49 Series of Dake presses is engineered for fast, dependable, economical molding of phenolic, urea, alkyd and epoxy compounds. You get more production with less maintenance *at lower cost!*

Take production, for example. Several users operate these presses on a fully automatic basis . . . 24 hours a day, 7 days a week. There are no rest periods, coffee breaks, washups or lunch times; so Dake's plastics molding presses deliver up to 14% more work than semi-automatics. In addition, they are the most reliable and have the fastest dry cycle speeds. Opening, unloading, filling and closing to the "slow close" point all take place in *less than four seconds.*

Maintenance costs are reduced, too, because of the simplified, air-operated toggle design. The feed tray is actuated by positive cams through the same mechanism, eliminating the need for additional feed cylinders and control valves.

And look at the savings. Your initial investment is lower than for other automatic presses of equal capacity. More important, one man can operate a battery of presses because a Dake plastics molding press requires only a fraction of a man's time to load the hopper and remove molded parts.

Dake's nationwide sales organization will be happy to acquaint you with these superior automatic molding presses, and serve you on the complete line of other Dake plastics presses.

Write today for a free copy of Dake's compression molding "Data Book". It discusses the economics of automatic thermoset molding, gives case histories, and explains many features and advantages of the Dake 49 Series.

DAKE CORPORATION
648 Robbins Road, Grand Haven, Michigan

DAKE PRESSES


Arbor Presses


Hand-Operated Hydraulic


Power-Operated Hydraulic


Guided Platen


Gap Type Presses


Movable Frame

THE PLASTISCOPE

(*From page 233*)

disposable cups, including the round nested type, is estimated to be from $250 to $275 million a year.

A sidelight on the PS cup, if it becomes universally accepted, is what will happen to the vinyl chloride-coated cup which is now used in great volume? This is a splendid cup that meets practically every requirement; yet prejudiced users insist that hot coffee from such cups still has a paper taste! This certainly isn't true but how does one overcome that type of public prejudice?

Plastics Institute of America

The Plastics Institute of America was incorporated on June 6, 1961. It is a non-profit membership corporation created to conduct fundamental research in plastics science and engineering, to carry on educational activities at the graduate-school level in these fields, and to provide a comprehensive technical information and library service to its members. The Institute is the result of four years of intensive planning by an independent, industry-wide committee.

An executive secretary, to work full-time on the Institute's affairs, has been appointed. He is Tom Zawadzki, formerly group manager of the Polyvinyl Chloride Dept., Borden Chemical Co., Leominster, Mass., and previously vice-president in charge of research and development for Cary Chemicals Inc., East Brunswick, N. J. Mr. Zawadzki assumed his new responsibilities on Oct. 15.

The initial research program to be embarked upon by the Institute is currently being mapped out under the direction of Dr. Emil Ott, formerly vice-president in charge of research and development for the Chemical Divisions of FMC Corp., New York, N. Y., and now a member of the Dept. of Chemistry at Rutgers Univ. The type of work which is logical for the Institute to conduct is in the nature of projects that will produce basic information which will benefit all members of the group, but which are too costly for any one member to undertake.

The process of selecting the educational institution with which the Institute will affiliate for carrying out its educational objectives, its research program, and its technical information and library service, is already under way, directed by Dr. Frank Reinhart, chief of the Plastics Section of the NBS Members **(To page 239)**

Clint Blount feted on retirement

One of the great national figures in the plastics industry is retiring. Clinton W. Blount, Vice-President—Marketing, Union Carbide Plastics Co., was recently honored by friends in plastics at a banquet in New York.

Known as "Uncle Clint" to hundreds of men in the industry whom he helped, taught, and advised, and to his peers as "Master of Molecular Marketing." Clint this year completed 37 years of service to plastics.

Born in Temple, Texas, on September 24, 1901, he graduated from high school in Fort Worth at the age of 15 and went on to Marion Institute in Alabama, where he was a part-time instructor in mathematics and a tactical officer in preparation for a naval career. He was graduated from the U. S. Naval Academy at Annapolis in 1922. Subsequently, he took courses at the Newark College of Engineering, Columbia University, and New York University. While at the Naval Academy, he rowed on the crew.

His classmates at Annapolis tell of the time that, as a midshipman, he was assigned to take soundings with a deep-sea lead line sounding device. After failing to reach bottom three times, he ran out all of the line and lost it. Thinking quickly, he called out to the Captain on the bridge, "No bottom when she carried away, Sir!"

On March 10, 1924, he became one of the early members of Bakelite Co.'s sales department. Through his indefatigable energy and natural ability he progressed steadily. After training in the use and application of molding materials, Clint was assigned as District Sales Engineer in the New York territory. He is still fondly remembered by many of the customers of that period. In 1932, he became Assistant Sales Manager. A primary responsibility was the training of sales engineers. Many of those in the forefront of the plastics industry today had their early training under him.

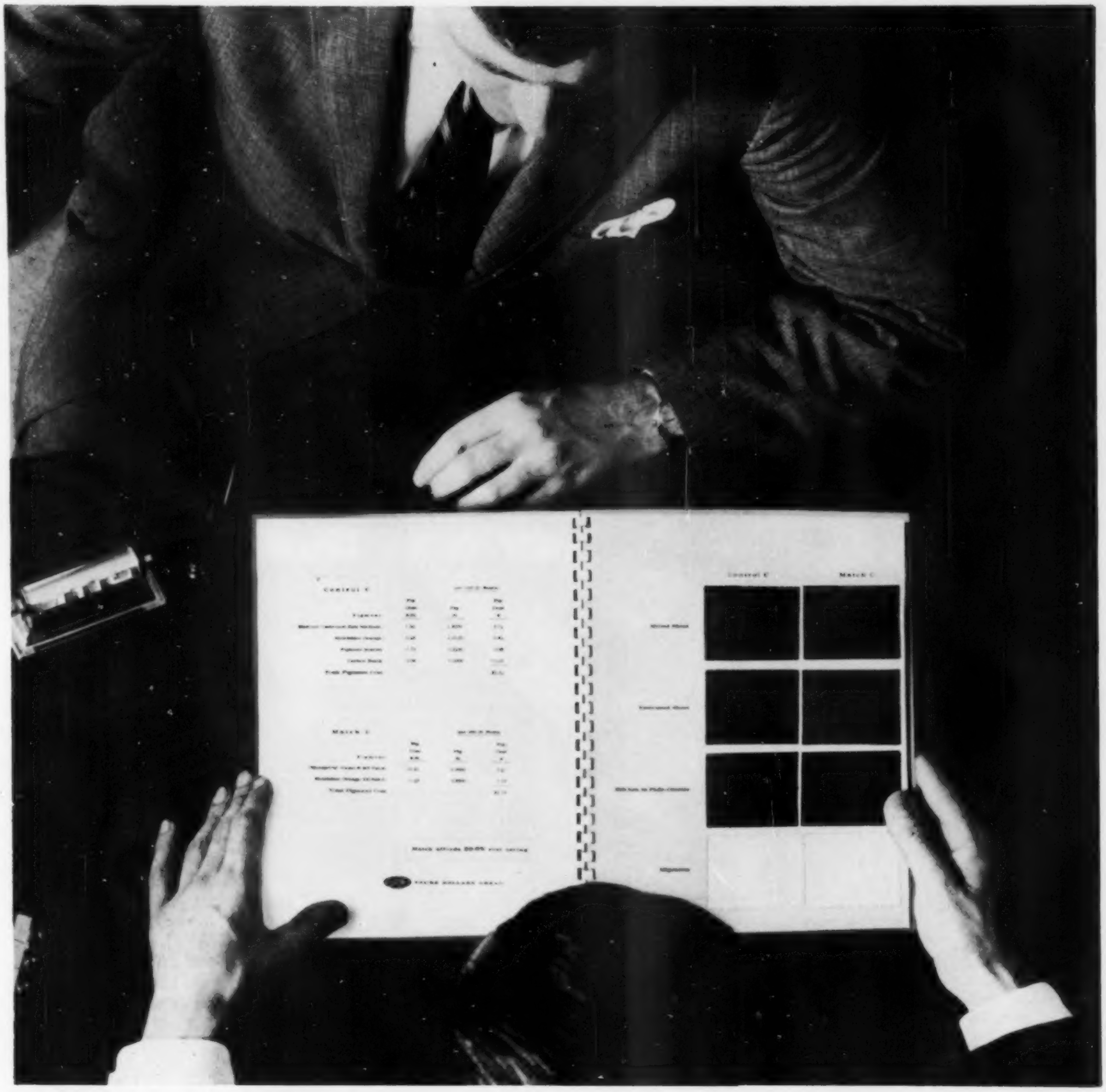
MR. BLOUNT holding cartoon presented to him at banquet. Colorful vignettes "depicted" milestones of his business and naval career history.

He moved to Union Carbide Corp. in 1939, when Bakelite Co. became part of Union Carbide Corp. In 1953, he became Vice-President—Sales of Bakelite Co., and in 1956, Vice-President—Marketing. Most recently he has been Vice-President—Marketing of Union Carbide Plastics Co., the successor to Bakelite Co.

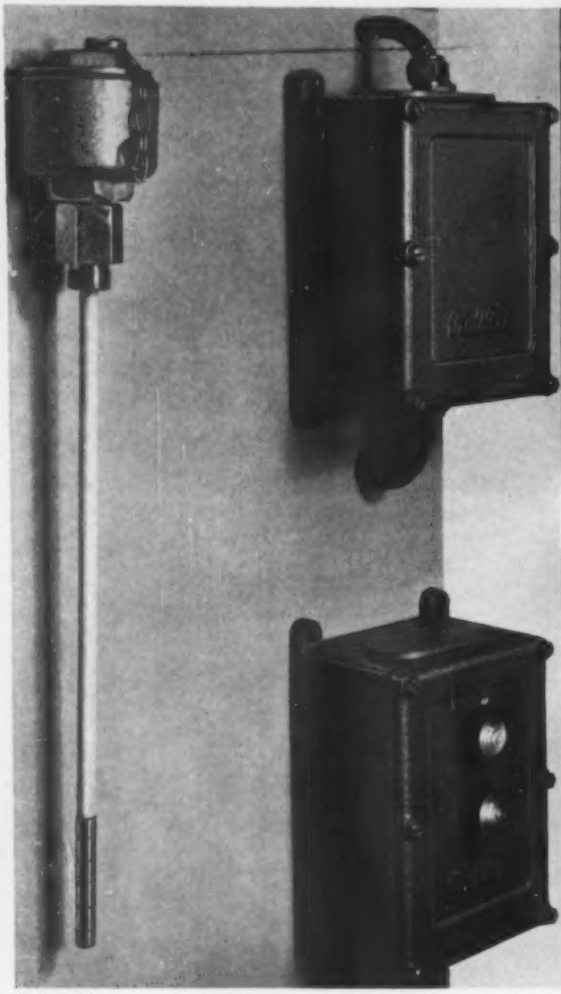
He is a charter member and past President of the Plastics Pioneers Assn. He is also a charter member and past Director of The Society of the Plastics Industry Inc., member of the Chemists Club, the SPE, the Naval Academy Graduates Assn., and Society of Naval Engineers.

Because of his tremendous knowledge and eminent background in plastics and marketing, he was a member of the plastics delegation to the Soviet Union in 1958, and of the business management delegation to Spain in 1959. Both of these trips were under the auspices of the State Department. It is typical of Clint Blount's thoroughness that in preparation for the trip to Russia he studied Russian.

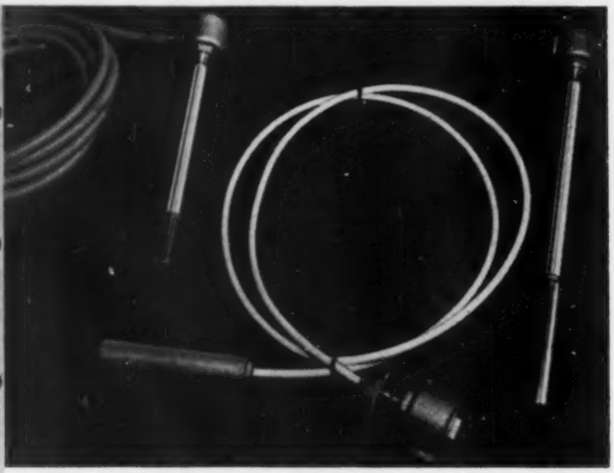
His hobbies are golf and farming, but his main interests are plastics and people. Clint lives in Ringoes, N. J. He is married to the former Elaine Jackson Heller.



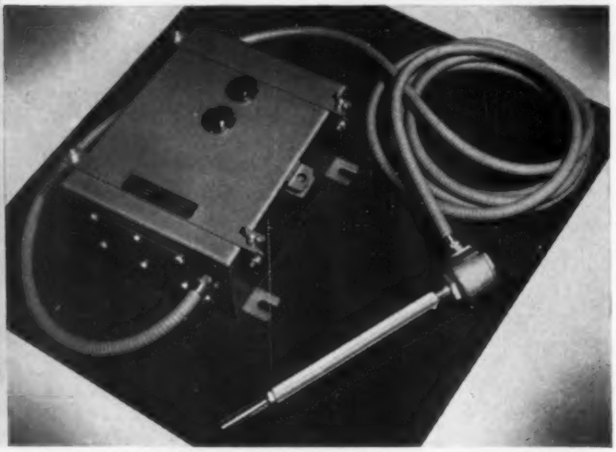
'FLUON' INCREASES PRODUCTION EFFICIENCY IN INDUSTRY



Tektor Type TT_5 *Transistorised level controller with associated lamp unit and type 9B 'Fluon' covered probe made by Fielden Electronics Ltd.*



Two Type 24 A 'Fluon' covered probes with a coiled Type 9B 'Fluon' covered Telstor probe made by Fielden Electronics Ltd., Wythenshawe, Manchester.



The new Fielden Tektor Major Level Controller, with associated Type 24 A 'Fluon' covered probe made by Fielden Electronics Ltd.

Fielden Electronics Limited use 'Fluon' to cover probes for their electronic control equipment

Fielden Tektor Level Controllers and Telstor Level Indicators operate on the capacitance principle and consist of an electronic unit and a probe, which is inserted into the container at the point at which control is required. The principle of operation does not require the substance being controlled to touch the metal probe, which can therefore be covered with an anti-corrosive, heat resistant insulation.

'Fluon' p.t.f.e. is used as a covering for probes to be used at temperatures up to 320°C. because of its excellent dielectric properties and its virtual immunity to attack from most chemicals up to this temperature. Its anti-wetting properties also prevent a film of liquid forming on the probe which, if allowed, could produce a false reading. 'Fluon' is a tough, flexible material with the lowest coefficients of friction of any solid.

'FLUON'

'Fluon' is the registered trade mark for the polytetrafluoroethylene manufactured by I.C.I.

Imperial Chemical Industries Limited, Plastics Division: Export Dept., Bessemer Road, Welwyn Garden City, Herts.

U.S.A. enquiries to: J. B. Henriques Inc., 521 Fifth Avenue, New York 17, N.Y.

Canadian enquiries to: Canadian Industries Ltd., Plastics Division, P.O. Box 10, Montreal P.Q.

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THE PLASTISCOPE

(*From page 236*)

Temporary headquarters for PIA have been set up at 237 State Rd., Princeton, N. J.

Dow's styrene-type latex gets FAA clearance

A regulation recently issued by the Food & Drug Administration on the status of certain components in Dow styrene-butadiene latexes clears two latexes for long-term use in food contact application, The Dow Chemical Co. has announced.

"Ingredients in both Dow Latex 630 and X-3352 are covered in this FDA regulation for use in food contact packaging," said John Donalds, Dow coatings sales manager. "To the best cf our knowledge the two Dow products are the first and only commerical styrene-butadiene latexes to have all of their ingredients subject to such coverage completely covered under the Food Additives Amendment of 1958," Mr. Donalds stated.

Vinyl magnets on appliances

A powerful new flexible magnetic gasket, said to permit appliance manufacturers to streamline their products and utilize additional space, has been developed by B. F. Goodrich Industrial Products Co. The new gasket is said to have 40% more magnetic power than the first Koroseal vinyl flexible magnets introduced as refrigerator door closures by BFG three years ago. The gaskets consist of a length of flexible magnet—an extruded Koroseal strip containing magnetized powder—encased in a "balloon" jacket of flexible Koroseal vinyl.

The new gaskets were first used as refrigerator door seals on 1960 models. The "pulling power" was increased on 1961 models, and the 1962

(*From page 239*)

models will have closures that are even more powerful. The stepped up magnetic power permits use of a thinner magnetic strip inside the vinyl gasket, the company claims; and, in addition to the increased magnetic strength, the new gaskets are tougher and more pliable than their predecessors. These gaskets hold the metal door firmly closed and reportedly provide a perfect seal. They are said to eliminate the need for latching mechanisms and permit manufacturers to take advantage of extra space and additional freedom of design. Tests are being conducted on other home appliances where magnetic closures are expected to prove more functional than conventional latches. The flexible magnetic strip can be extruded in almost any shape and size in any required length.

Harshaw stabilizers to Ferro

Ferro Chemical Div., Ferro Chemical Corp., Bedford, Ohio, has acquired the vinyl stabilizer business of Harshaw Chemical Co., Cleveland, Ohio. The acquisition includes all products and formulations, production and technical service techniques, development and research records, patents, and other rights.

The Ferro technical service dept. and facilities have been expanded, and R & D in vinyl stabilization have also been stepped up, Ferro states. Donald G. Knowles and other Harshaw key vinyl sales and development personnel have joined Ferro's staff.

Vinyl tubing

A new line of clear vinyl (PVC) tubing, designated Synflex V-1, is available from Samuel Moore & Co., Mantua, Ohio. Said to be non-toxic, with U. S. Dept. of Agriculture approval for foods, the tubing is virtually unaffected by most inorganic acids and alkalies. V-1 tubing may be sterilized with steam at 220° for 30 minutes. It is available in four sizes of outside diameter: $\frac{1}{4}$-, $\frac{5}{16}$-, $\frac{3}{8}$-, $\frac{7}{16}$-, and $\frac{1}{2}$-in., with a wall of $\frac{1}{16}$ inch.

Vinyl statement at press conference

While the total volume of resilient flooring business in 1961 probably will be only slightly higher than the level achieved in 1960, it is encouraging to note that the mild recession apparently has hit bottom and the direction of activity for the balance of the year will be gradually upward in contrast to last year's downward drift, according to H. A. Jensen, gen-

THE PLASTISCOPE

(*From page 241*)

eral sales manager, Floor Div., Armstrong Cork Co. He said it is important to note that, in resilient flooring, 1960 was not a bad year by any measurement. In the case of Armstrong, it was the second-best year, exceeded only by 1959.

As consumer income rises and general psychology improves, retail sales should respond accordingly. Moreover, new home building has begun to show increasing strength, while the home improvement business, which has expanded strongly and steadily, is expected to accelerate even further in the second half of this year. Nonresidential construction volume should continue to run ahead of 1960 during the next quarter of the year. The image of resilient flooring has been up-graded to a marked degree and the products are now appealing to a wider range of customers. The element of style so pervades the business today that the retailer is no longer selling material by the square foot or the square yard, but he is selling a room concept, according to Mr. Jensen.

Since 1955—just six short years ago—the sales of permanent resilient flooring have increased 26 percent. There is every reason to believe, said Mr. Jensen, that this growth pattern is just in its infancy as vinyl achieves its potential in satisfying today's discriminating consumer.

Ultra-Pak containers

When Bemis Bro. Bag Co. acquired the patent rights to the Ultra-Pak packet, the machine for producing the same, and other related features, Bemis formed a subsidiary, Packaging Frontiers Inc., Waltham, Mass., to further develop this approach to flexible packaging and to arrange for its marketing.

Packaging Frontiers Inc. is forming an organization, acquiring facilities, and conducting engineering activities that are required to serve present and potential customers. The principal product is the Ultra-Pak machine which forms, fills, and seals tetrahedral packets in a single-stage packaging operation. A wide variety of flexible packaging materials may be used, from the relatively simple polyethylene-coated papers to multi-laminate structures. Applications for the Ultra-Pak are visualized in well-diversified groups of products such as dairy, beverages, edible oils, drugs and pharmaceuticals, cosmetics, soaps, fertilizers, paints and pigments, and many other chemicals.

Packet sizes presently available

THE PLASTISCOPE

(*From page 243*)

range from ⅛ to 8 fl. ounces. Sizes extending up to 1 qt. are being planned. Package costs vary depending upon the product to be packed and packaging material protection required. For example, packaging material costs for the 6-oz. packet will vary anywhere from ½¢ to slightly over 1¢ each as the packaging material requirements become more rigorous. Generally speaking, the Ultra-Pak is said to have a cost advantage up to 50% over flat packs or pouches in the smaller size ranges and extending to as high as 6 oz. in some cases. In the 6-oz.-and-above category Ultra-Pak competes with rigid containers such as bottles or cans, where it is said comparative savings in packaging materials can be as high as 75 to 85 percent.

It is the company's present intention to lease machines based primarily on production rental royalties. Information as to the amount of such charges is not yet available. Royalties will be in one way or another keyed to packaging cost savings realized by the customer.

Postforming-grade laminate

A postforming-grade, high-pressure laminate, tradenamed Nevamar, has been announced by The National Plastic Products Co., Odenton, Md. According to the company, higher temperatures can be applied to postforming-grade Nevamar for faster press cycles in sink top, vanity top, and other special fabricating operations. It is available in sheet sizes 30, 36, and 48 in. wide by 96 and 120 in. long, and in a wide selection of colors, patterns, and finishes.

Printed circuits sales up

Sales for printed circuits totaled approximately $25 million in 1960, up 36% from 1959, according to the Institute of Printed Circuits, Chicago, Ill. The IPC estimates that an additional unreported $25 million is produced by companies for internal use. 58% of 1960 sales were for military applications and 42% for industrial and commercial uses, IPC found. The 1961 outlook is for an increase in commercial and industrial sales.

In analyzing the profit picture in the industry, the IPC report shows that average manufacturing overhead expense is about 31.8% of sales.

RP continuous extrusion

Plastic Age Co., Saugus, Calif., has added to its present line of compression molded structural shapes, equip-

THE PLASTISCOPE

(*From page 245*)

ment for a process of continuously extruding reinforced plastics structural shapes. The equipment, plus covering patents, were acquired by the company from Glastrusions Inc. Production of the RP continuous extrusions using the new process will start shortly, the company states.

For outdoor signs

Weather-resistant, durable plastic sheet extruded from special formulations of Tenite butyrate for signs, letters, panels, and other outdoor applications has been reported by Eastman Chemical Products Inc., a subsidiary of Eastman Kodak Co., Kingsport, Tenn. Tradenamed Uvex, the material is said to have low-moisture absorption, high surface gloss, and excellent dimensional stability. The sheet will be extruded by the company's Plastic Sheeting Div., Rochester, N. Y., and by other plastic sheeting extruders under license from Eastman.

Uvex sheet is available in thicknesses ranging from 0.060 to 0.125 in., and in clear, white, and a variety of different colors.

Sewer pipe standard

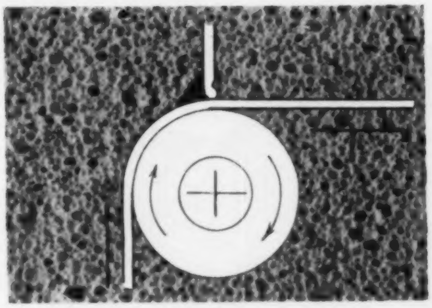
A new edition of Commercial Standard 228-61, which includes styrene-rubber sewer pipe in 8-, 10-, and 12-in. diameters, has been published by the U. S. Dept. of Commerce. The new Standard supersedes Commercial Standard 228-60, and provides a reorganized specification for municipalities, engineers, and architects in specifying sewer pipe for mains, 8-in. in diameter and larger. Plastic pipe for sewerage systems is widely accepted particularly for its ease of jointing. Joints are made by solvent welding, a process of chemical fusion whereby the weld becomes the strongest part of the pipe. Longer lengths and light weight also contribute to ease of installation. Additionally, styrene-rubber pipe is non-absorbent and highly chemical-resistant.

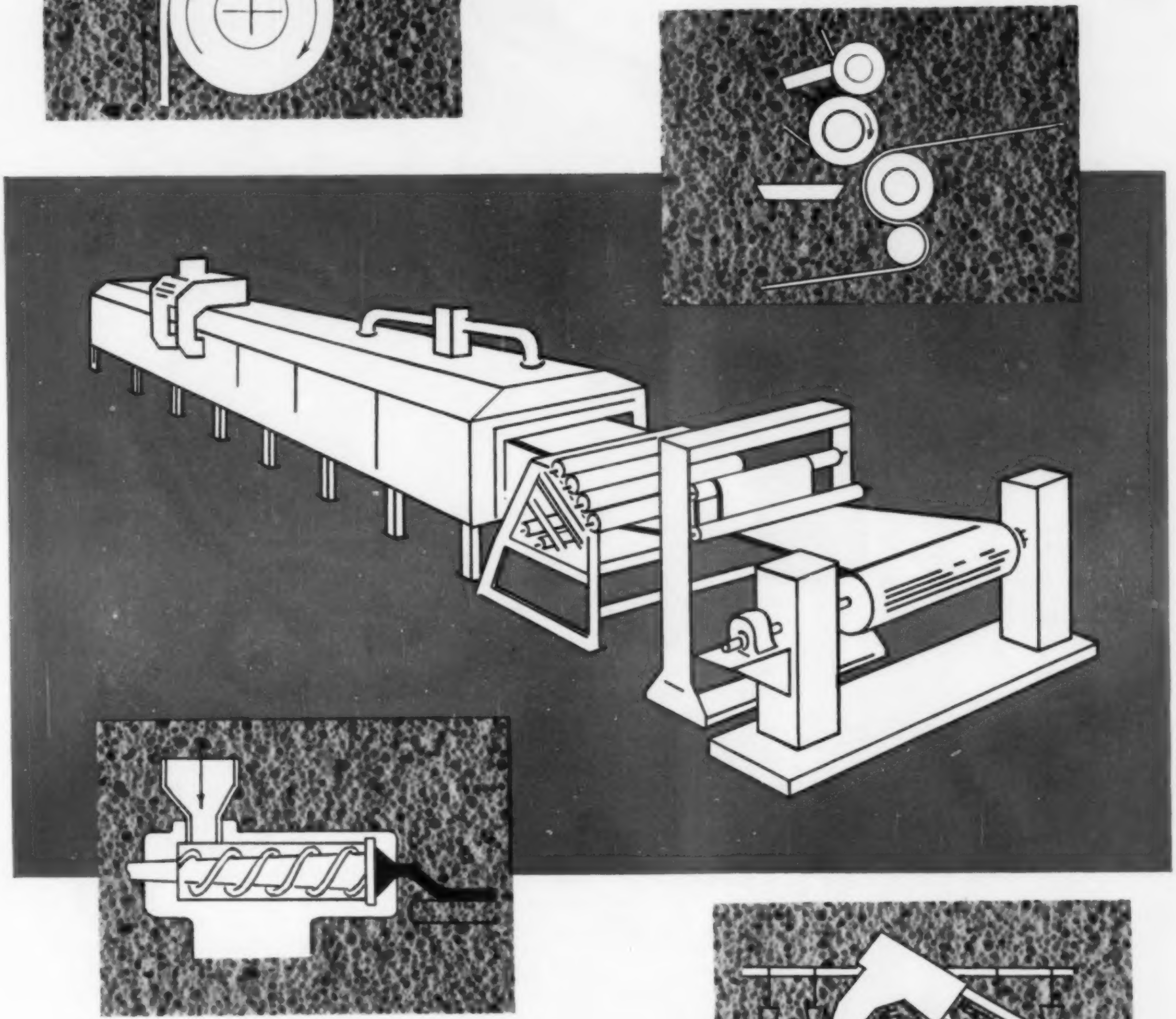
Copies of Standard 228-61 are available by writing to the Superintendent of Documents, United States Printing Office, Washington 25, D.C., at 10¢ per copy.

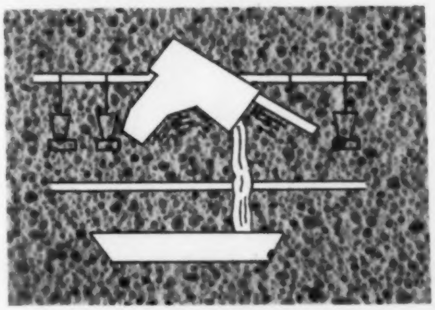
Polypropylene belting

A flame-resistant polypropylene belting, extruded like plastic netting, is being offered by Nalle Plastics Inc., Austin, Texas. It is a variation of the company's extruded netting that is used for packaging produce, handbags, and various other purposes. The

Kempore







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THE PLASTISCOPE

(*From page 246*)

net belting, said to be tough and strong, is produced in special widths, and is suggested for such items as reinforcement of ladies' skirts, belts, handbags, and as a trim for hats. It is offered in six different colors.

Regular formulation sells for \$1.60/lb.; with UV inhibitor or flame inhibitor it is \$1.65 per pound. The yield is 117 ft. of 1½-in. belting/lb. of material and 180 ft. of 1-in. belting.

Fast coating service

Coatings of Teflon on a diversity of equipment and machinery used in the drug, chemical, candy, and food processing fields can now be applied in many instances, as an overnight service with spray-coating facilities recently added to the in-plant customer services department of Tri-Point Industries Inc., Albertson, N. Y.

Ceiling materials lab

A laboratory for testing and evaluating luminous ceiling material has been put into operation at Hexcel Products Inc., Berkeley, Calif. The lab is constructed so that on-the-job room conditions of commercial, industrial, and residential areas—including ceiling height, beams, and ductwork—can be exactly simulated.

The new lab is available to architects, consulting engineers, and companies desiring design or technical assistance on lighting. Hexcel produces plastics honeycomb products.

Brine tank

A fibrous glass-reinforced polyester brine tank, manufactured by Apex Reinforced Plastics, Cleveland, Ohio, is said to be rustproof, corrosion resistant, and not susceptible to fracture under impact. Because of the centrifugal molding process by which the tank is produced, longitudinal seams are eliminated and surface textures are smooth. Available in 30- or 40-gal. capacities, the new brine tanks may be ordered in tan, gray, or green.

Sealant material

Compriband, a compressible waterproofing sealant based on the impregnation of urethane foam with asphalt, which was originally developed in Holland, is now available in the United States through Pacific Sealants, Long Beach, Calif.

Compriband is being used extensively throughout Europe as a joint sealer in buildings for windows, doors, panels, expansion joints, and various concrete and metal applications; also for bridges and roads, air-

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- A more homogeneous melt — extreme accuracy on heat control
- Positive metering of shot weight — no packing
- Greater injection speeds — for thin walled and deep core items

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INJECTION MOLDING MACHINE DIVISION

LOMBARD GOVERNOR CORPORATION

ASHLAND, MASSACHUSETTS

THE PLASTISCOPE

(*From page 249*)

fields, tunnels, dams, reservoirs, swimming pools, pipe joints, and many other similar uses.

Under compression, the original cellular structure of Compriband becomes completely water tight and bonds to contacting surfaces. According to the company, the material has permanent resiliency and recovery to make it constantly strive toward its original shape and size, even under concentrated and prolonged loads.

Exhaustive tests are said to indicate that it will sustain innumerable cycles of expansion and contraction without showing signs of fatigue or loss of recovery characteristics.

Dry blend mixing

Recent tests disclosed increased production rates up to 60% on dry vinyls when previously extruded and pulverized material is added to the dry blend mix, according to Pallmann Pulverizers Co. Inc., Hoboken, N. J. Finished pipe and end products are reported to have better quality with the addition of pulverized compound. Both scrap and prepared virgin materials were used in these tests.

Expansion

Hercules Powder Co., first producer of polypropylene in the United States, has announced completion of its multi-million-pound polypropylene fiber plant in Covington, Va. This plant, with an initial annual capacity of 12 million lb., is readily expandable in order to meet market demands of the future. Hercules polypropylene fiber is being produced at the former Industrial Rayon Corp. nylon facility, which has been completely redesigned for this purpose.

At the same time, Hercules announced that a complete fiber research center has been established at Covington, occupying a large portion of the former IRC rayon plant there. Facilities have been built to perform all steps in fiber development from chemical research through fabric construction and end-use testing.

Hercules PP fiber is available in three forms: continuous multi-filament yarn, staple fiber, and tow. Polypropylene fiber can be used for woven, nonwoven tufted, and knitted fabrics, according to Hercules.

Midland-Ross Corp. has negotiated an agreement with **Ameliorair S.A.,** Paris, France, for the manufacture and sale of a broad range of products of the **J. O. Ross Engineering Div.** of Mid-

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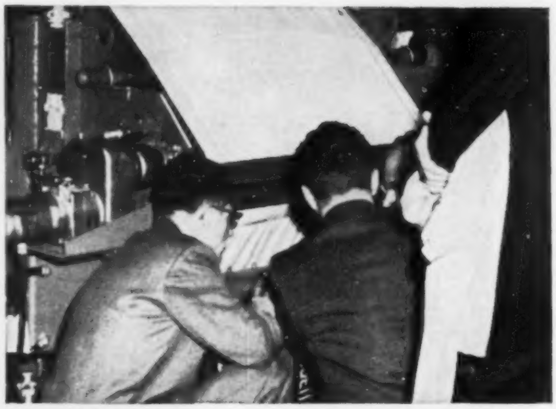

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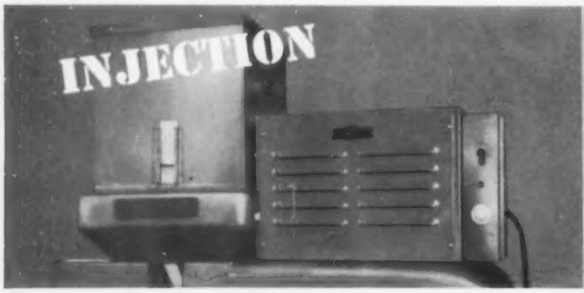

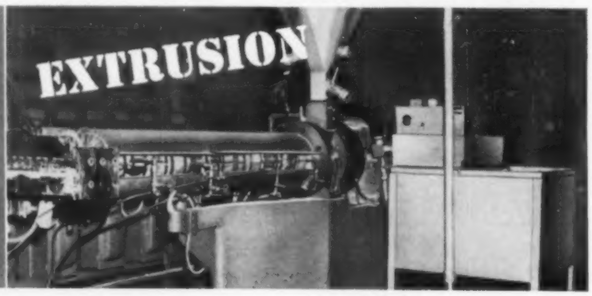

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(From page 251)

land-Ross. Under the terms of the agreement, Ameliorair is granted the rights for the manufacture, sale, and distribution of ovens, dryers, and metal preparation units for paint finishing and metal decorating lines; resin ovens and air heaters as well as all other products manufactured in the United States by the Ross Engineering Division.

The complete product lines of the company's **Waldron-Hartig** and Ross Divisions now have been licensed for manufacture in Europe. Earlier this year, Midland-Ross made an agreement with **Henry Simon Ltd.** in England for the manufacture and sale throughout Europe of the Waldron machinery products of its Waldron-Hartig Division.

B. F. Goodrich Chemical Co., Cleveland, Ohio, has announced completion of a \$3.5 million Australian plant for the manufacture of vinyl resins. The new plant is located in a multi-million-dollar petrochemical complex at Altona, near Melbourne. Raw materials used to produce BFG Chemical's Geon vinyl resins at the plant come chiefly from other manufacturing facilities that are located in the Altona complex.

The plant is being operated by **B. F. Goodrich-C.S.R. Chemicals Pty. Ltd.,** a company formed early last year by the Cleveland firm and **C.S.R. Chemicals Pty. Ltd.** of Sydney, Australia. The Australian partner firm has been actively associated with plastics for a number of years and also manufactures a line of plasticizers for polyvinyl chloride.

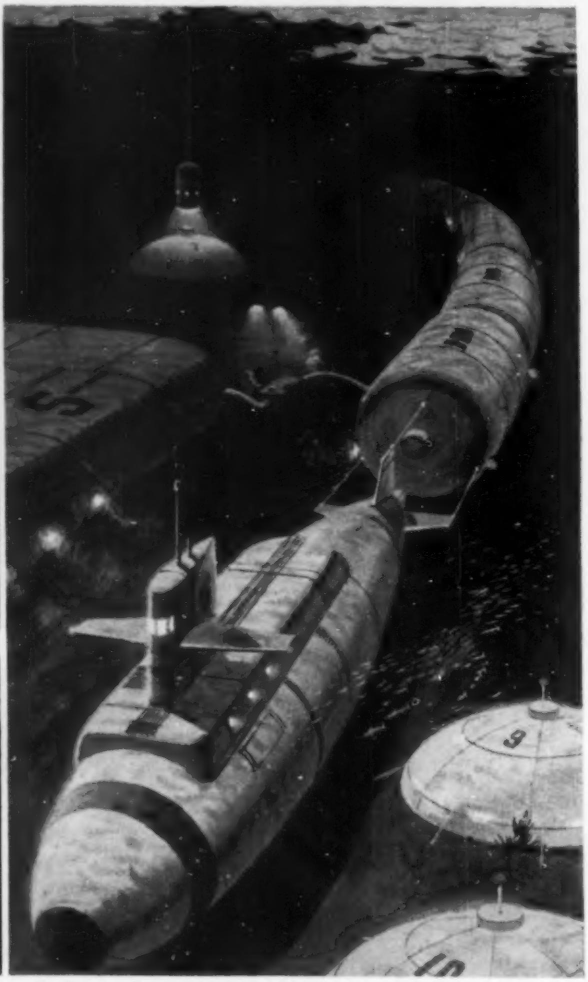
The new Australian company is the seventh overseas BFG Chemical associate firm. Others are located in the United Kingdom, Japan, Canada, Brazil, Mexico, and Holland. These operations, together with its own plants in the United States, make BFG Chemical one of the largest producers of vinyl resins in the world.

Moore Manufacturing Inc., San Francisco, Calif., has purchased the machinery, inventories, and other principal assets of **Aetna Manufacturing Co. Inc.** Aetna becomes the **Amco Div.** of Moore, with headquarters in San Francisco, and a modern factory at Burlingame, Calif.

The new division, with an annual capacity of over 3 million lb., will manufacture vinyl cove base and vinyl carpet base for the flooring, tile, and building industries. Heavy basic plastic manufacturing equipment in-

High road or low road . . . fabrics figure as key structural material

On the drawing board: orbiting space stations (top) fold to fit in rocket nose cone, inflate with gas. Astronauts are protected by space suits of special coated fabrics.



In the development stage: fabric fuel tanks (left) can be anchored or towed by submarine for underseas storage. Right: fabric pressurized hemispheres for on-the-bottom mining.

Problem: build orbiting space stations—durable, yet light and compact for stowing aboard rockets. *Problem:* build giant tanks to store fuel deep in the ocean—light enough for towing, strong enough for long-term anchorage. *Solutions* under consideration: specially engineered fabrics.

High strength-to-weight ratio, flexibility, portability, toughness: these are the basic properties which make fabrics indispensable in exploration. And the special properties which can be engineered into fabrics are nearly endless.

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(*From page 253*)

cludes a 4½-in. electronic extruder, 60-in. mills, and complete PVC mixing and compounding facilities. **E. D. Brown** has been appointed general manager, and **Luther Landon** will serve as plant superintendent of the new Amco Division.

Industrial Plastic & Engineering Co., Orange, N. J., and **Timely Technical Products** have merged, with Industrial Plastics operating as a division. The new company has complete facilities for custom molding, extrusion, fabrication, and distribution of fluorocarbon products.

Weber Plastics Inc., Stevens Point, Wis., has constructed a new plant in Minneapolis, Minn., to meet increasing demand for custom-molded, expandable polystyrene packaging, container, and display units. The new facility includes over 10,000 sq. ft. of manufacturing space, with plant equipment designed and built by Weber technical personnel.

Guild Plastics Inc., a division of **Maryland Cup Corp.**, is constructing a new 110,000-sq.-ft. plant in Wilmington, Mass., for the manufacture of plastic disposable containers. The company will move its entire production department, research and development, and executive offices from its present Cambridge, Mass. location to the new site. Located on 17 acres of land, the plant will employ approximately 200 people.

Guild Plastics was founded in 1957. The company first manufactured plastic Guildware sundae dishes and Banana Boats specifically designed for the ice cream industry. Since then, it has added to its line a variety of sizes of plastic cups, food containers, and plates. The company's line of consumer packages is marketed under the tradename Variety Fair.

J & B Plastics Co., Inc., Fairfield, Iowa, has announced a $100,000 expansion program which includes construction of a new processing plant located on a 5-acre site east of Fairfield. Vinyl will be compounded there and transported to the present plant for the extrusion process.

California Oil Co., Eastern Div., has awarded a contract for the design, engineering, and construction of a 30 million lb./yr. phthalic anhydride plant to **Badger Mfg. Co.** The plant will be constructed at Perth Amboy, N. J., and is expected to be completed

THE PLASTISCOPE

(From page 255)

in the fall of 1962. California Oil Co. will operate the plant for **Oronite Div. of California Chemical Co.** Design for the plant will be based on **California Research Corp.**'s fixed bed process for phthalic production by oxidation of orthoxylene.

Nylomatic Corp., Morrisville, Pa. injection molder, has erected an addition to its plant which doubles manufacturing space to a total of 8400 sq. ft., and provides room for new molding machines as well as other plastics production equipment.

A. H. Wirz Inc. has acquired an additional 27,000 sq. ft. of warehouse space adjacent to its Chester, Pa. plant. This space serves the double purpose of freeing space within the main plant for more production lines, and allows for the storage of the company's finished tubes and plastics bottles prior to shipment to customers.

Tenneco Chemical Co., Houston, Texas, has awarded a contract for the design of its planned 200 million lb./yr. vinyl chloride monomer plant to **Crawford & Russell Inc.,** Stamford, Conn. The monomer plant, which the company claims will employ newly-developed techniques in vinyl chloride manufacture, is part of a new petrochemical complex to be built by Tenneco Chemical on the Houston Ship Channel.

Formica Corp., Cincinnati, Ohio, has established doors and panels as its fourth product division. Formica door facilities have been moved from Jacksonville, Fla. to a 40,000-sq.-ft. plant at Tarboro, N. C., which will also enable Formica to provide cut-to-size, pre-veneered panels to furniture and case goods manufacturers.

Establishment of the new division gives the company four basic product lines: decorative laminated plastic for horizontal and vertical surfacing; industrial laminates for mechanical, electrical, and chemical applications; Flakeboard for underlayment to laminated pastics, and a line of adhesives to bond laminates to cores; doors and building panels.

Fred R. Loetscher has been named to serve as product manager, Formica doors and panels.

Star Supermarkets Inc. has acquired **Spaulding Inc.,** Chicago, Ill. manufacturer of melamine dinnerware. Spaulding has been engaged primarily in the production of melamine dinner-

NIKKO Extruders For NON-PLASTICIZED Polyvinyl Chloride Film & Sheet

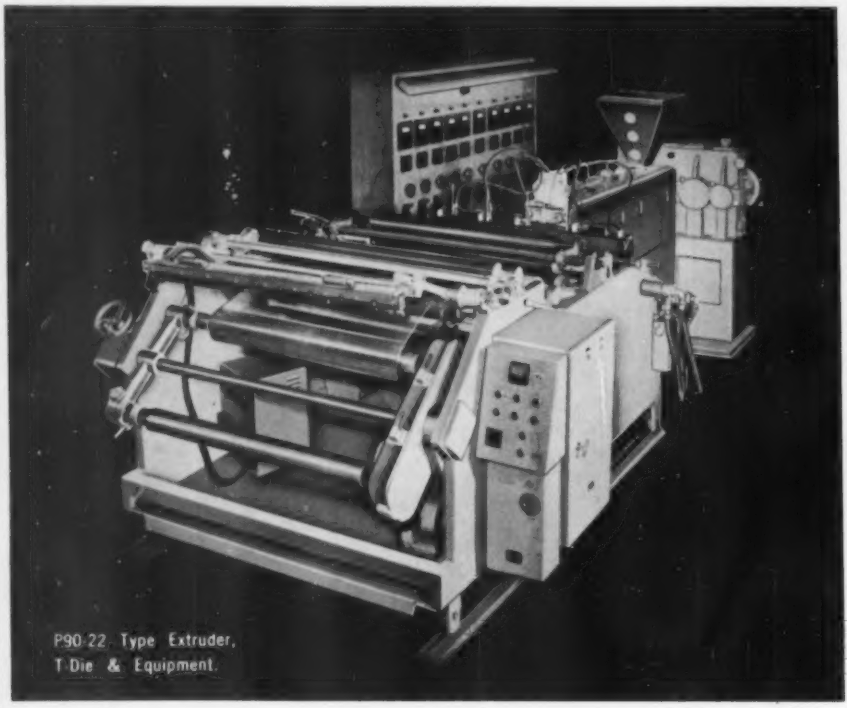
Over half a century's experience and technical knowledge has made JAPAN STEEL WORKS, LTD. Japan's foremost manufacturer of machinery and steel products. Now they are making the world's most advanced equipment for processing polyvinyl chloride film and sheet - the dependable, high capacity NIKKO Extruder, T-Die and Equipment. This latest development in plastic processing machinery fulfills the traditionally strict standards of NIKKO efficiency and durability.

Uses for **NIKKO EXTRUDERS:** pipe, tube, T-die system film, embossing film, inflation system film, sheet, corrugated sheet, wire and cable coating, laminating, pellets, straining, profile and other products.

NIKKO EXTRUDERS
Standard Specifications

Model No.	Drive motor kw	Screw			Heater		Output kg/hr
		Diameter mm	L/D	rpm	Zone	kw	
P 25—12	2.2	25	12	40~120	2	2	4
P 40—22	5.5	40	22	40~120	3	4	25
P 65—22	11	65	22	40~120	3	12	60
P 90—22	30	90	22	40~120	3	24	110
P 112—22	55	112	22	20~60	4	32	200
P 150—22	75	150	22	20~60	4	54	400
P 200—20	150	200	20	17~50	5	100	600
P 250—20	190	250	20	15~45	5	140	800
P 300—20	220	300	20	12~35	5	180	1,000

Note: Model No. includes figures corresponding to the screw diameter and L/D



P90-22 Type Extruder, T-Die & Equipment.

Specifications:
T-Die System Sheet Processing Equipment

Materials used: Non-plasticized polyvinyl chloride, polyethyrene, sthyrene, acrylic, etc.
Uses of sheets produced: For vacuum moulding, door insulation of refrigerators and similar purposes.
Extruder: 90, 112, 150mm (3 1/2, 4 1/2, 6") L/D=20 or 22.
Cylinder heating: Electric induction heating for 90mm extruder. Aluminium cast sheathed wire heating for other than 90mm type.
Sheet thickness: From 0.2 to 2mm (from 8 to 80 mil).
Width: From 910 to 1,070mm (from 36 to 42").
Take-up speed: From 1 to 10m/min (from 3 to 30'/min) Stepless.
Driver motor: 3.7 kW (5 HP). commutator motor, D.C.
Cutting: Automatic cutting system by means of photo-tube.
Winding paper core: Inside diameter, 127mm (5") core for the sheet of 0.5mm or less in thickness. Piling up by stackers for the sheet of more than 0.5mm thickness.

Specifications:
T-Die System Film Processing Equipment

Materials used: Non-plasticized polyvinyl chloride, polyethylene, polypropylene and similar kind.
Use of film produced: High class wrapping, for damp proof cellophane and other purposes.
Extruder: 90 or 112mm (3 1/2 or 4 1/2") L/D=20 or 22.
Cylinder heating: Induction heating for 90mm extruder. Aluminium cast sheathed wire heating for other than 90mm type.
Film thickness: From 0.02 to 0.1mm (from 0.8 to 4 mil).
Width: From 914 to 1372mm (from 36 to 54"). The maximum 1836mm (72") in case of polyethylene.
Take-up speed: From 6 to 60m/min (from 18 to 180'/min).
Drive motor: Take-up, from 1.5 to 2.2 kW (from 2 to 3 HP). Winding from 0.8 to 1.5 kW (from 1/2 to 2 HP) D.C. motor.
Winding: Automatic cutting and rewinding under tension control.
Winding paper core: Inside diameter 76mm (3").

For detailed information, write

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THE PLASTISCOPE

(From page 257)

ware to be used as premiums and packaged supermarket merchandise for the past seven years. Star intends to maintain this aspect of the plastic company's business. Star also announced intentions of setting up a Spaulding division for manufacturing industrial moldings.

Rexall Drug & Chemical Co., Los Angeles, Calif., has acquired **White Metal Manufacturing Co.,** producer of collapsible metal tubes, slugs, and aluminum cans. According to Rexall, the acquisition of a metal tube manufacturing company would complement Rexall's existing container and packaging division.

Admiral Plastics Corp., has acquired the **Akron** and **Supermarc Companies** through a pooling of interests. It is reported Akron stockholders received 185,000 shares of Admiral Plastics common stock and Supermarc stockholders received 60,000 shares. Both Akron and Supermarc are engaged in service merchandising of non-food items in supermarkets.

Minnesota Mining & Manufacturing Co. and **H. I. Thompson Fiber Glass Co.** are negotiating for the sale of 3M's **Zenith Plastics Division** at Gardena, Calif. to HITCO. The proposed transaction is intended primarily to avoid competition with customers of 3M's Reinforced Plastics Div. in St. Paul, Minn., which markets a variety of uncured preimpregnated structural reinforced plastics for use by fabricators. HITCO processes fibrous insulation materials for missile and jet aircraft use.

Plastics Corp. of America, Minneapolis, Minn., has added **Stearns Manufacturing Co.,** St. Cloud, Minn. as its fourth division since its organization late in 1960. Founded as a parent company for a group of complementary plastic manufacturers PCA now includes **Moxness Products Inc.,** Racine, Wis.; **United Fabricators and Electronics,** Stillwater, Minn.; and **Cole Rubber & Plastics Corp.,** Palo Alto, Calif. Stearns Manufacturing Co. is a manufacturer of a variety of plastics products for hunting, camping, and marine equipment.

New companies

Edison Technical Services, Edison, N. J., has been formed by **Allan L. Griff,** who was formerly with the Technical Service Dept., Union Car-

(From page 259)

bide Plastics Co. Mr. Griff will act as a consultant specializing in thermoplastic fabricating technology, both in the U. S. and abroad.

Fortune Chemical Corp., 40 Iowa Ave., Paterson, N. J., has been formed as a wholly-owned subsidiary of **Kaysam Corp. of America** to manufacture plastisol, organosol, latex, acrylonitrile, and polyisobutylene compounds, etc. Officers of the new company are **Ernest Gelles,** president; and **George C. Guard,** vice-president.

Coming events

Plastics groups

Dec. 1: S.P.E. Cleveland Section, Retec, "Screw Injection Molding," Sheraton Cleveland Hotel, Cleveland, Ohio.

Dec. 7, 8: S.P.I. 9th Plastic Film, Sheeting, and Coated Fabrics Conference, Pierre Hotel, New York, N. Y.

Dec. 9: S.P.I.–S.P.E. Midwest Sections, Annual Christmas Party, Grand Ball Room, Pick-Congress Hotel, Chicago, Ill.

Jan. 30-Feb. 2, 1962: S.P.E. 18th Antec, "Plastics Revolutionize Design," Penn-Sheraton Hotel, Pittsburgh, Pa.

Feb. 6-8: S.P.I. 17th Reinforced Plastics Div. Conference, Edgewater Beach Hotel, Chicago, Ill.

May 18-29: Europlastique 62, Porte de Versailles, Paris, France. Contact: Paul Thevenin, Secretariat d'Europlastique, 10 Rue du Mont Thabor, Paris 1°.

Other groups

Nov. 27-Dec. 1: 28th Exposition of Chemical Industries, Coliseum, New York, N. Y.

Nov. 28-Dec. 1: Chemical Market Research Assn. (CMRA) National Meeting, Mark Hopkins Hotel, San Francisco, Calif.

Dec. 1: Akron Polymer Lecture Group, "Some Optical Studies of the Morphology of Crystalline Polymers," University of Akron, Akron, Ohio.

Dec. 5-7: Building Research Institute Fall Conferences, Shoreham Hotel, Washington, D. C.

Jan. 15-19, 1962: 36th National Housewares Exhibit, McCormick Place, Chicago, Ill.—**End**

Mr. Lorentz, right, and Mr. Anthony Robinson, Supervisor of Styroflex Division, discuss production results as displayed on the BetaMeter Control Console. Above inset shows BetaMeter in operation.

"Quality is our prime consideration at Natvar"

All Styroflex operations at Natvar are carefully controlled to uphold quality standards.

". . . and Curtiss-Wright BetaMeter gives us round-the-clock quality control of our custom-formulated Styroflex film," states Mr. Robert C. Lorentz, plant manager of Natvar Corporation, Woodbridge, New Jersey.

Natvar Corporation is a leading manufacturer of flexible insulation for electronic and electrical industries throughout the world. For the precise production of Styroflex film, Natvar relies on Curtiss-Wright BetaMeters to assure and maintain exact uniformity down to 0.00025" film.

The BetaMeter is ideal for all applications where close tolerances and finest quality are of prime importance. Variations in thickness are instantly detected and recorded during actual production. Material being measured is not contacted nor is the process affected in any way. The Curtiss-Wright BetaMeter permits optimum control of production variables, improves quality and increases profits by reducing costly scrap losses.

Automatic process control equipment is available for all standard BetaMeter measuring systems.

For information on how the Curtiss-Wright BetaMeter can benefit your plastic film, sheet or coated stock operation, phone SWinburne 9-0500 or write.

Curtiss-Wright Mark II BetaMeters, for handling up to 36" webs, are priced from $4985 (Strip-chart recorder included).

Princeton Division CURTISS WRIGHT CORPORATION Princeton, New Jersey

IN CANADA: Canadian Curtiss-Wright Ltd., Industrial Process Controls, Davis Road, Oakville, Ontario

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, JULY 2, 1946, AND JUNE 11, 1960 (74 STAT. 208) SHOWING THE OWNERSHIP, MANAGEMENT AND CIRCULATION OF MODERN PLASTICS, published monthly at United States Post Office, Bristol, Connecticut, for October 1, 1961.

1. The names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, Alan S. Cole, 770 Lexington Ave., New York City.

Editor, Joel Frados, 770 Lexington Ave., New York City.

Managing editor, James J. Guerrier, 770 Lexington Ave., New York City.

Business manager, Stuart Siegel, 770 Lexington Ave., New York City.

2. The owner is: (if owned by a corporation, its name and address must be stated and also, immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as those of each individual member, must be given.)

Breskin Publications, Inc., 770 Lexington Ave., New York, N. Y.

Charles A. Breskin, 59 Park Road, Scarsdale, N. Y.

Mrs. Millie Breskin, 59 Park Road, Scarsdale, N. Y.

Mrs. Linda Klein, 94 Harwich Road, Newton, Mass.

Mrs. Millie Breskin and Stuart Siegel as Trustees, 59 Park Road, Scarsdale, N. Y., 770 Lexington Ave., New York City.

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E. S. Gregg, 632 Oakland Ave., Statesville, N.C.

3. The known bondholders, mortgagees, and other security holders owning or holding one percent or more of total amount of bonds, mortgages, or other securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowedge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required by the Act of June 11, 1960 to be included in all statements regardless of frequency of issue.) 35,970.

ALAN S. COLE, Publisher

Sworn to and subscribed before me this, 21st day of Sept., 1961.

[SEAL] BEATRICE GROVE

Notary Public, State of New York
No. 31-6689250, Qualified in New York County,
Commission expires March 30, 1962.

COMPANIES . . . PEOPLE

Firms and personnel in the news—what they're doing . . . and where

Union Carbide Corp.—Union Carbide Plastics Co.: John R. Peterson named office mgr., Cleveland, Ohio dist. sales office. **Richard A. Daily,** tech. rep., transferred from South Atlantic sales region to Minneapolis, Minn. sales office. **Douglas L. Peterson,** tech. sales rep. transferred from North Central sales region to Moorestown, N. J. regional sales office.

Visking Co.: Thomas R. Clarke promoted to newly created position of asst. to gen. sales mgr., plastic films. **John H. Morrison Jr.** has been appointed mgr. field sales development for plastic films.

Monsanto Chemical Co.—Plastics Div., Springfield, Mass.: **Martin G. Caine** promoted from product sales mgr., vinyl resins, to development assoc. **John G. Gorman** appointed product sales mgr., vinyl resins. He is succeeded as gen. mfg. supt. by **Fitzhugh L. Turner. Yoon-Chai Lee** and **Robert Toggenburger** joined the research dept. **Harold H. Hopfe** joined the engineering dept., and **Kent L. McQuivey** the production technical service dept.

Plastics Div., Texas City, Texas: James C. Holland joined the tech. service dept.; **Lawrence H. Holmes Jr.,** the research dept.; and **James P. Hutchinson,** is now with the engineering services dept.

Chocolate Bayou Project, Alvin, Texas: Whelan W. Klemme appointed chief chemist.

B. F. Goodrich Co. consolidated various divisions' marketing responsibilities into a new industrial products marketing group: **James C. Richards,** who was formerly v-p–sales of Goodrich's **Industrial Products Div.,** heads the new organization as v-p–marketing. The new group has responsibility for such products as conveyor and transmission belting, hose, molded and extruded plastic and rubber products, and vinyl pipe and sheeting manufactured by the Industrial Products Div. Additional responsibilities transferred from other divisions include industrial footwear, automotive, and industrial cellular materials.

Gene L. Bego named gen. sales mgr., **Industrial Products Co.**

F. J. Stokes Corp., Philadelphia, Pa.: Joseph A. Maddocks appointed to field sales staff, Vacuum Div., with headquarters at Framingham Center, Mass. **J. Hervey Sternbergh** joined the field sales staff and will headquarter in Rochester, N. Y.

Allied Chemical Corp.—National Aniline Div.: Jerry L. Hoffman appointed sales rep., urethane chemicals, working out of Chicago, Ill. headquarters. **Kenneth C. Laughlin** appointed asst. to dir., R & D, stationed at National's Chesterfield location near Hopewell, Va.

FMC Corp.: Norbert E. Talbert appointed market development rep. for the Epoxy Dept. **Donald F. Doehnert** appointed plastics engineer for decorative laminates at the firm's Baltimore, Md. research facilities.

Heyden Newport Chemical Corp.: Arthur Minich appointed pres., **Heyden Chemical Div.,** succeeding **R. M. Aude,** who died on Aug. 20. Mr. Minich has been pres. of the **Nuodex Products Div.** since 1955.

Nuodex Products Div.: William J. Houston appointed exec. v-p and **Dr. H. W. Schultze,** tech. dir. **Daniel W. Klohs** named mgr. vinyl additives. Nuodex produces additives for plastics, paints, and other forms of finished chemicals.

Owens-Illinois Glass Co. has begun production at its blown bottle plants in the South, which bring to 12 the number of locations in which O-I's Closure and Plastics Div. is manufacturing PE containers for liquid household products. **John D. Flexon** is mgr. of the Charlotte, N. C. plant, and **William E. Green** manages the Atlanta, Ga. plant.

Rexall Drug & Chemical Co.—Rexall Chemical Co.: Wallace H. O'Dowd and **John B. Rutherford** appointed sales reps. in the Midwest region, responsible for sales of the company's polystyrene, polyethylene, and polypropylene resins.

IMCO Container Co.: Leroy E. Durkin appointed sales mgr. to serve the Eastern Div.

The Borden Chemical Co.: C. Gordon Jelliffe, pres. of **Columbus Coated Fabrics Co.,** named a v-p. Columbus Coated Fabrics was acquired by Borden Chemical earlier this year, and is now operated as a div.

Floyd Sherman appointed tech. sales rep., and **Richard C. Allen,** tech. service rep. for the Adhesive & Chemicals Division.

Cosden Petroleum Corp., subsidiary of **W. R. Grace & Co.,** Big Spring, Texas: **Paul V. Ames** joined the polystyrene marketing staff as sales mgr., Eastern region. **William R. Claypoole,** formerly with Spencer Chemical Co., is based at Akron, Ohio as polystyrene mgr., Central region.

Cosden Petrochemical Corp.: Franklin E. Eck, marketing mgr. of chemicals and plastics, has been named pres. of this new subsidiary, which will headquarter in New York.

Johnson Mfg. Co. Inc., Chippewa Falls, Wis. mfr. of extrusion accessory equipment: **Richard D. Brown** appointed rep. in Ill., Ind., Mich., and Ohio. **Kenneth E. Jarvar** named rep. in Minn., Wis., and Iowa.

Admiral Coated Products Inc., Hackensack, N. J. mfr. of hot stamping foil for the plastics industry, has opened a branch office in Chicago, Ill. **Dick Zern** is mgr.

Celanese Plastics Co.: Bruce L. Martin appointed supv. of PE film sales Eastern states, and **Larry S. O'Hearn** named supv. of polyethylene film sales, Central states.

Cadillac Plastic & Chemical Co. opened its 22nd warehouse at 1811 Berry Blvd., Louisville, Ky.

Robert B. Jacob, pres. of Cadillac Plastic & Chemical, elected exec. v-p of **Dayco Corp.,** the parent company. He is succeeded as pres. of Cadillac Plastic by **Richard J. Jacob,** who was formerly exec. v-p.

Pyles Industries Inc., Detroit, Mich. mfr. of automatic mixing and dispensing equipment for use with sealers, coatings, epoxies, etc., has opened an Eastern Branch office at Iselin, N. J., with **David R. Davis** as mgr.

Diamond Alkali Co., Cleveland, Ohio: **J. P. Okie,** formerly mgr., Plastics Div., appointed to a new position, dir. of planning, with responsibility to the pres. for special projects. **Roger G. Richards** formerly dir. of development, appointed general mgr. of the Plastics Div.

Cary Chemicals Inc., vinyl resin and compound mfr.: **Gordon Rozand** appointed dir., mfg. for all of Cary's mfg. facilities at Flemington, Burlington, and East Brunswick, N. J. **James C. Hahn** appointed works mgr. for the new 100-million-lb.-yr. polymer plant that is now under construction at Burlington.

David S. Greenfield joined **Hostachem Corp.,** Mountainside, N. J., as national sales mgr. for unplasticized PVC films produced by **Kalle AG.,** Wiesbaden-Biebrich, West Germany, which is a subsidiary of **Farbwerke Hoechst AG.** In addition to distribution of Kalle plastic films in U. S., Hostachem Corp. also sells the products made by Farbwerke Hoechst AG., and other Hoechst subsidiaries.

New reps.

Blaze & Assocs., Cleveland, Ohio, appointed rep. to the reinforced plastics and other industries for **Balsa Ecuador Lumber Corp.,** producer of

ADM CHEMICALS/FOCUS ON FUNCTION

Now! A fully flexible resin with 4 times more strength and stretch

NEW Q-6030 FLEXIBLE POLYESTER

Flexible resins too flimsy? Rigid resins too brittle?

Then here is the breakthrough you've been waiting for: ADM's new Q-6030.

This unique flexible polyester produces laminates and castings with four times more strength . . . and four times more stretch . . . than ordinary flexible resins. Yet, new Q-6030 is *fully flexible*, not brittle like rigid resins.

Compare Q-6030 strength. You have to hit hard to drive a spike through it. But you can easily poke the spike through a conventional flexible film by hand.

Compare Q-6030 stretch. The spike pierces it slick and clean like a bullet fired through a tin can. Ordinary flexible films tear like Swiss cheese under far less impact.

The photos above show what we mean.

These properties—coupled with low cost and light color—make Q-6030 ideal for a variety of functions, including: auto body patch and solder, caulking and sealing compounds, gaskets, and many laminating applications.

Q-6030 also has the high impact strength, vibration dampening, and low exothermic heat—all the properties essential for electrical potting and encapsulating.

But let us send you more information about this unusual resin . . . new Q-6030. Write, wire or call us.

COMPARE—Rough treatment produces a spider-web of rips in gelatin-like sheets cast from ordinary flexible resins. But tough, firm Q-6030 elongates without either ripping or shattering.

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COMPANIES . . . PEOPLE

(From page 264)

lightweight structural core material. Blaze & Assocs. also represent **Exeter Mfg. Co., Standard Insulation Co., Bean Fiber Glass Inc., U. S. Peroxygen Corp.,** and **Thermoset Plastic Inc.** . . . **Riverdale Plastic & Chemical Corp.,** Los Angeles, Calif., named distributor in 11 Western states for **Nypel Corp.,** West Conshohocken, Pa. producer of nylon injection molding compounds . . .

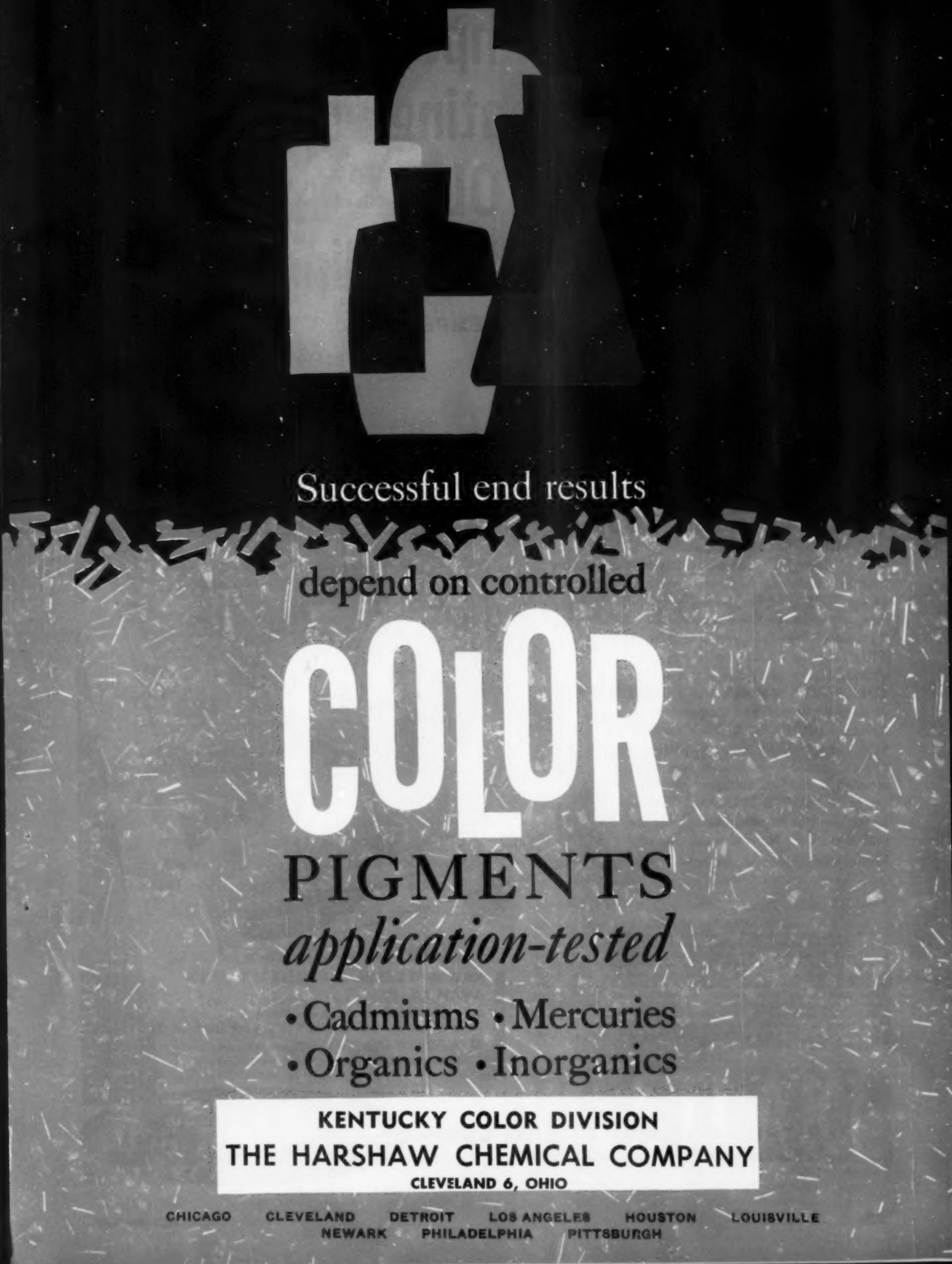
Narmco Materials div. of **Telecomputing Corp.** appointed **Polycon Electronics,** Redwood City, Calif., and **Westron Sales & Engineering,** Los Angeles, Calif., as distributors for its potting and encapsulating compounds, epoxy adhesives, protective coatings, etc. . . . **Chemical Process Co.,** Redwood City, Calif., named West Coast distributor by **Atlas Chemical Industries Inc.,** Wilmington, Del., for its Atlac 382 bisphenol polyester resin . . .

King Fiber Glass Corp., Seattle, Wash., named sales agent in the Pacific Northwest for **Durez Plastics Div., Hooker Chemical Corp.,** for Hetron polyesters, anhydride, and Hetrolac . . . **Reese Chemical Co., Plastic Materials Div.,** Chicago, Ill., appointed rep. in the Chicago area for **Injection Molders Supply Co. Inc.,** Cleveland, Ohio . . .

Leewood Corp., Lowell, Mass. mfr. of polyurethane cushioning material appointed the following reps.: **Johnson & Cotton Inc.,** Winston-Salem, N. C., Southeast Atlantic states; **Anderson & Assocs.** Minneapolis, Minn., Minn., Iowa, and Dakotas; **Major Sales Co.,** Irving, Texas, South-Midwestern states; **Galaxy Inc.,** Phoenix, Ariz.; **Dygert & Stone Inc.,** Rochester, N. Y.

Correction

In the article, "Filament winding goes commercial," MPl, Oct. 1961, p. 94, credit for data and photographs was erroneously given to the Union Carbide Chemicals Co., Div. of Union Carbide Corp.; the credit rightfully should have gone to the Union Carbide Plastics Co., Div. of Union Carbide Corp. It is this latter division that supplies epoxy resins for filament winding and is currently engaged in market development work in this area. Credit should also have gone to Owens-Corning Fiberglas Corp. for supplying data on several of the filament-wound applications described in the article, as well as on developments in glass reinforcements for filament winding. The October cover was designed and photographed especially for MODERN PLASTICS by Ray Cicero.—**End**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AUTOMATICALLY HOLDS TEMPERATURES WITHIN ±1°F

SUPER-TROL was designed specifically for the plastic fabricator. For injection molding, vacuum forming, blow molding, film extrusion, and film laminating. It lets you pick your temperature and hold it automatically within 1 F . . . adjusts with a single knob . . . saves electricity and water . . . responds with speed. Your product quality is protected, assured, maintained.

Utilizing the principle of High-Temperature-Cooling*, SUPER-TROL achieves close-limit temperature control through a closed-circuit water circulating system employing high-velocity, high-capacity pumps and heat exchanger controlled by an exclusive, patented electrical temperature regulator.

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*Conventional methods of cooling introduce cold water directly into the circulating system to remove excess Btu's. Overcooling at the inlet end of the circulating system and undercooling at the outlet end result in uneven temperatures across the plate or roll — and spoiled work. SUPER-TROL's High-Temperature-Cooling method is basically the use of circulated water at only a few degrees lower than design temperature **pumped at high rate**, rather than the use of cold water, to cool. Because the difference between desired temperature and circulating water temperature is slight, the tendency to overcompensate is drastically reduced and cooling is uniform. Thus it is possible to maintain a much closer degree of thermal accuracy, and more even temperatures, throughout the plate, mold, or roll.

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Machinery and Equipment For Sale

FOR SALE—Liquidating chemical plant, Little Rock, Arkansas; Worthite 2" x 1½" & 3" x 2" cent. pumps; Baker-Perkins #16-UUEM, 150 gal. jacketed dispersion mixer, 150 HP XP drive, Vaulted cover; 100 gal. Baker-Perkins T347SS jacketed dispersion blade mixer; Baker-Perkins 200 gal. jacketed sigma-blade mixers; 200 gal. and 500 gal. stainless jacketed reactors; 1350 gal. T347 stainless jacketed resin kettle; American 42" x 120" dbl. drum dryer, ASME code, stainless trim; 2600 gal. T316 stainless pressure tanks, coils, dished heads; 800 sq. ft. T316 SS shell and tube heat exchangers; Baker-Perkins #15-UUMM, 100 gal. jktd. dispersion blade mixer, 100 HP; Worthington 70 cu. ft. rotary blender; Sturtevant 75 cu. ft. Stainless rotary blender; we pay cash—top dollar—for idle, surplus equipment. Perry, 1429 N. 6th St., Phila. 22 Pa.

FOR SALE — Reed Prentice Plastic Presses: 1951 4 oz Model 5A4 Serial 60019, very clean, in perfect condition, with all controls, $3800.00. 1954 Model 175T 4-6 oz Serial 62446, spare IMS cylinder, 4 zone control for nylon, excellent condition, $10,000.00. Punch Press: 1952 37T #4 L&J #41699, complete with motor and controls, good condition, $750.00; with roll feed, $950.00. All machines FOB, Sterling, Illinois. Wahl Clipper Corporation, Sterling, Ill.

INJECTION MOLDING—HPM 9 oz; Hydraulic Press, French oil semiautomatic 100 ton; Mill-Farrell 16 x 36; Baker-Perkins SS 100 Gal 2 Arm Jac. vac. Hyd. tilt 50 HP; 150 Gal Day Imperial Sigma; 3 Baker-Perkins 100 Gal Sigma Jac. Hyd. tilt; Calender 3 roll 18 x 48 Birmingham; Extruder 8" elec. heated; Ram extruder. Machinecraft Corp., 800 Wilson Ave., Newark, N. J. MI-2-7634.

FOR SALE—Auto-Vac Vacuum Former, EQA-181. Drape, straight vacuum, plug attachment. Bed 54" x 74" Single station, automatic cycle, complete with vacuum receiver, pump, and two Sterlco Model 6012 temp. control units. Arvey Corporation, 3500 N. Kimball, Chicago 18, Ill., Robert Blizzard.

PLASTIC MACHINERY—Injection molding machine, Moslo 74-7—2½ oz, 6" rubber or plastic strainer, 60 HP. Plastic skin packing machine, bed 21" x 28". Take-ups, Dual reel wire type—Hartig 2". T. Baum, OL 6-2020 (N.J.); WH 3-5793 (N.Y.).

REED PRENTICE INJECTION MOLDING MACHINES—Believed never used, built 1956. (7) 12/16 oz. model 300TA stroke 12½" 16 oz w/multiple stroke. Die plates 29" x 32¼". Mold opens 12½" adj. 7". Mold thickness 18", Closing 300 ton. Semi-auto. elec. timing controls. Heating cyl. 220 v/3 control pyrometers, 30 HP 3/60/550 or rewound for 440 or 220 extra cost (each) $15,000. (4) 24/28 oz. Model 450T, str. 16", 28 oz w/multiple stroke die plates 45" x 40". Mold opens 16", mold thickness 24", closing 450 tons, (same as above) (each) $19,850. (2) 32 oz. Model 600T, str. 24", die plates 54" x 45". Mold opens 24", closing 600 tons. 50 HP motor (same as above) mold thickness 32", (each) $25,000. Rotary Assembly Auto. Tables 96" dia, 24 stations, cost new $7000. equal to new, used six months only, $Any Offer. Spring Testing Machines for testing deflection on plastic devices, $12,000 cost new, new 1957. Any offer. (2) Pneumatic Presses 2 tons, new '57, used 3 mos. only, self-contained, $2500 cost new, equal to new. Any Offer. Hot Air High Velocity Conveyor Type Drying Mchne, fully auto. 34" width of belt. Ideal for drying, baking in quantity. new 1957, equal to new. Any Offer. Conveyor Dryer 36" width conveyor, at room temp. forced air circ. $30,000 cost new, equal to new. Any Offer. All Machines Can Be Seen Running, Located New England, Used by Govt. Only. Kept For Stand-by Units. Eveready; 805 Housatonic Ave; Bridgeport, Conn. EDison 4-9471-2 E. J. McCallum, Prop.

FOR SALE—(2) 6" Hartig late model, electrically heated extruders. Excellent condition, now in use on styrene sheet. Each has 100 HP, 440 V., new Louis Allis motor, still in crate. No head or temp. control included. Head can be designed for your special purpose. A bargain at $11,000.00 each. Also Royle rebuilt 2", 3¼", 4½", 6", 8½" extruders to meet any requirement. Hot plastic strainers our specialty. Our equipment guaranteed. Videx Equipment Corp., 444 Hartung Drive, Wyckoff, New Jersey. Tel: TW 1-3040.

BLOW MOLDING MACHINES HONG KONG—Unused machine three inch extruder, 2 sta. del. N.Y. duty paid only $4000.00. Others from $2200.00 to $5700.00. Molds Injection and Blow Molds. Constructed to spec very low prices. Exclusive U. S. dist. for machinery and molds. Kroll Trading Co., 133 Greene St., NYC. OR 4-1414.

FOR SALE—(1)—Readco 200 cu. ft. stainless steel jacketed ribbon blender; (1)—4½" Hartig electrically heated plastics extruder 20 to 1 L/D; (1)—Stokes model 800—15 ton automatic molding press; 2 Dunning & Boschert 300 ton compression molding presses; (2)—Ball & Jewell rotary cutters #1, #½. Chemical & Process Machinery Corp. 52 9th Street, Brooklyn 15, N.Y., HY 9-7200.

MOST MODERN PACKAGING AND PROCESSING MACHINERY — Available At Bargain Prices—Baker-Perkins, W. & P. and Day Double Arm Steam Jacketed Heavy Duty Mixers—25, 50, 75 and 100 gal. capacities. Day, Robinson 50 to 2,000 lbs. Dry Powder Mixers, Jacketed and Unjacketed. Also wood and Enamel. Devine (Porter) 650 gal. Steam Jacketed Double Spiral Mixers. Day Imperial 50, 75 and 100 gal. Double Arm Mixers, Sigma, Dispersion Blades, Mikro No. 6 Stainless Steel Atomizer with Collector. Mikro Pulverizers, Models Bantam, 1SH, 2DH (S.S.) 2TH, 3TH and 4TH. Fitzpatrick Models D and K-7 Stainless Steel Comminuters. Colton Models 241 and 260 Double Rotary High Speed Tablet Presses. Package Machinery, Hayssen, Scandia, Wrap King, Campbell, Miller Wrappers. Cartoning Machines — Ceco, Pneumatic Scale, Jones. Union Standard Equipment Company, 318 Lafayette Street, New York 12, N. Y. Phone: CAnal 6-5333.

FOR SALE — Two (2) Davis-Standard caterpillar type take-off machines. Equipped with 1 H.P. U.S. Varidrive motors. 4 speed transmission 15 to 380 feet per/min. Good operating condition. Colorite Plastics Inc., 50 California Ave., Paterson, N. J.

FOR SALE—(1)—Thropp 2-Roll Mill 18" x 50", 6" x 12", 2" x 6", complete with motors; (2)—Cumberland #18 and #½ Gradulators with motors; (3) — Baker-Perkins 50, 100 and 150 gal. Sigma blade jacketed Mixers; (1)—P-K 1 cu. ft. 304 SS "V" Blenders; (3)—Mikro Pulverizers, Bantam, 1SH and 1SI; (5)—Stokes Preform Presses, models R, T, DD2, DDS2 and D4; partial listing, send for details. Brill Equipment Company, 35-55 Jabez St., Newark 5, N. J. Tel: MArket 3-7420.

FOR SALE—Stokes Molding Presses. 50 Ton, model 741. Full automatic. Also Stokes Standard 50 ton, semi-automatic. Blow Molding Set Up—2" Kato, one year old, complete with all controls and blow molding equipment. With variable speed drive. Injection Molding Machines—4 oz. Harvey, 8 oz. Reed Prentice, 12 oz. DeMattia, 12 oz. Reed Prentice. All in stock. Immediate delivery. Colton #5½ T Single Punch Preform Press, complete with motor drive. 1" NRM Lab Extruder, complete with drive and controls. 2" National Erie, Electrically Heated Extruder with vari drive and extra screens. Scrap Grinders—1½ HP up to 50 HP available. We have a full line of Laminating Presses, Molding Presses, Mills, Calenders, Extruders, Injection Molders, Scrap Grinders, Coating Equipment and other accessories for the Plastic Industry. We Will Finance. Johnson Machinery Company, 90 Elizabeth Ave., Elizabeth, N. J. EL 5-2300.

TREMENDOUS VALUES. 3" x 8" Thropp Lab. Mill. Ball & Jewel Cutters size #½ & #1. Extruders 1" NRM, 2" National Erie, 6" Royal, 6" National Erie. 150 Gallon Day Imperial Mixer, jact. sigma blades. Pony Mixers 2½, 8, 15, 40, 80 gal. Keith Machinery Corp., 73-15th St., Bklyn., N. Y. ST 8-5502.

EQUIPMENT THAT PAYS FOR ITSELF! (6) Stokes Self Contained Molding Presses 150 Ton with 3 HP Hdr. Pump System. (2) HPM Self Cont. 25 Ton; 18" Strokes, 40" Daylt. (2) D.&B. Presses 12" Ram, 48" D.L.; 33" x 26". S.B. 450 Ton Press with 36" x 36" Platens. Preform Presses, Stokes #280, Model T,DD2 etc. 4 Roll Inverted L Calender, 12" x 24" 3 Roll Calenders, 6" x 18", 22" x 60" F.B. 2 Roll Mills, 16" x 40", 22" x 60". F.B. Banbury Mixers No. 00, No. 9, No. 11. Hartig 4½" and 6" Electric Extruders. MPM 1½" and 2½" Electric Extruders. NRM Oil Heated 2½" Extruder, complete. Welding Engrs. 2" Twin Screw Extruder. Cumberland Size 14 Pelletizer. Ball & Jewel and Cumberland Rot. Cutters. Taylor-Stiles Precision Cutter No. 224. First Machinery Corp. 209-289 Tenth St., Brooklyn 15, N. Y. STerling 8-4672. Cable: Effemcy.

FOR SALE—Two Impco 2 oz Injection machines Model HA2-125. They are equipped with dual nozzles and are in first class condition. Excellent for container or flower pot molding. Plast-O-Pak Corp., Leominster, Mass. Tel. Keystone 4-8336.

FOR SALE—Fiber Glass 52" Preformer. Fiber Glass Ovens. Turner Roving Cutter. 500 ton W-S hobbing press. 500 ton Utility five 48" x 30" platens. Four 300 ton Molding Presses various makes. HPM 200 ton downstroke. Watson Stillman 240 ton, ten 24" x 56" platens. W&W 200 ton, 24" x 42". Stokes Standard. 150 and 50 ton semi-automatic. D&B 150 ton, 25" x 25". French Oil 120 ton self-contained. 50 ton Birdsboro 24" x 20". Stokes 15 ton automatics. Hydraulic pumps and accumulators. New ¾" plastic extruder. Other sizes to 6". Banbury #3 Mixer. Seco 6" x 12", 2-roll Mills and Calenders. Farrel & Thropp 40" and 48". Other sizes to 60". Despatch electric heated ovens and other types. New ¾ oz. Bench Model Injection Machines. Van Dorn 1 and 2 oz. Other sizes up to 100 oz. Baker-Perkins and Day jacketed Mixers. Taylor-Stiles Pelletizer 3 HP. Plastic Grinders. Stokes & Colton Preform Machines. Partial listings. Send for Bulletin #194. We buy your surplus machinery. Stein Equipment Company, 107-8th Street, Brooklyn 15, New York. ST 8-1944.

FOR SALE—Blow Molding Equipment—Several Blow mold machines. Many toy and doll molds. Call collect, A. Baum, WH 3-5793 (NYC).

Machinery Wanted

WANTED—Plastic molding injection machine. From 5 to 16 ounces. Reply Box 7058, Modern Plastics.

WANTED—Stokes Compression Molding Presses, 150 and 200 ton capacity. Please advise age and serial number. Write Box 7061, Modern Plastics.

WANTED—VACUUM-METALLIZER 66" Tank in good condition. Reply Box 7064, Modern Plastics.

Materials For Sale

MATERIALS FOR SALE—50,000 Fiberglass pieces. These pieces are 20 inches in diameter, clear resin, with varying thickness from .048 to .073 inches. Will send a sample board to all interested parties. The C. E. Ward Company, New London, Ohio.

(Continued on page 272)

(Continued from page 270)

FOR SALE—Reprocessed high and medium impacts 20,000 lbs. each natural, red, white, blue and yellow. Also color matching acetate—clear, red, blue, white, yellow, black. Color matching. Polyethylene—Natural, all colors and fluorescents. Special color matching. Plastic Molding Powders, Inc., 487 Forest St., Kearny, N. J., N. Y. Phone WH 4-5725-6, N. J. Phone WY 8-0044-6.

FOR SALE—Standard bright colors and Jet black in both Acetate and Butyrate; Linear Polyethylene and Polypropylene in natural and colors; Impact Polystyrene—Virgin and reprocessed. All at good savings. Reply Box 7083, Modern Plastics.

Materials Wanted

NYLON SCRAP wanted by reprocessors. Quotations promptly furnished on all grades of nylon extrusion (including wire coating), molding and fabricating scrap. Adell Plastics, Inc., 5208 Eleanora Ave., Baltimore 15, Md.

PLASTIC SCRAP WANTED—Clear Acetate and Butyrate sheet scrap, cast acrylic, acrylic molding powder, styrenes, etc. We pay top dollar for your plastic scrap and surplus molding powders. Write, wire or phone collect—TL 3-3111, Philip Shuman & Sons, Inc., 571 Howard Street, Buffalo, New York.

WANTED — PLASTICS OF ALL KINDS — virgin, reground lumps, sheet and reject parts. Highest prices paid for styrene, polyethylene, acetate, nylon, vinyl, etc. We can also supply virgin and reground materials at tremendous savings. Address your inquiries to: Goldmark Plastic Compounds, Inc. 4-05 26 Ave. Long Island City 2, N. Y. RA 1-0880.

EUROPEAN FIRM WANTS — Thermoplastic Scrap, surplus lots and reclaims from Acetate, Butyrate, Nylon, Polypropylene, PVC. Reply Box 7080, Modern Plastics.

MATERIALS WANTED: Wanted several truckloads of Cycolac "T" or Kralastic "MH", separated light mixed colors or natural off-grade. Also, need Cycolac "C" or Kralastic 2938 natural. Send small sample of each color stating type, quantity, flow and price. Reply Box 7084, Modern Plastics.

WANTED: V-100 or HM-140 Acrylic—clean regrind. Will take metallized or painted Acrylic parts before grinding. Send sample and state pounds or number of pieces of each available. Also, have requirement for painted or metallized Cyc. "T" or Kralastic "MH" in volume lots. Parts must be unground. Send sample and quantities of each available to Box 7085, Modern Plastics.

Molds For Sale

FOR SALE OR LEASE—Die for manufacture of Rocket Pistol shooting rubber ball tipped missile. Assembly parts for 20,000. Sample on request. A perfect 5 cavity Die. Daily Mfg. Co., P. O. Box 275, Austin 62, Texas.

Molds Wanted

WANTED—Molds for making toy items and playballs on 6 arm Akron Presform Rotational Molder. Include complete information and prices. Reply Box 7065, Modern Plastics.

MOLDS WANTED—Will purchase poker chip rack, chess set, checkers, roulette wheel, charms and kindred items molds. Write today. Reply Box 7055, Modern Plastics.

Help Wanted

EUROPEAN CHEMICAL CO. has need for a consultant: Polyamide Molding Compounds. We demand process improvement, new processes, application know-how, etc. Contact: Havas n° 260/598 rue Vivienne 17,—PARIS (France).

TECHNICIANS, PLASTIC FABRICS, familiar with equipment and processes of vinyl laminating. Knowledge of printing helpful. Excellent opportunity. Our staff knows of this ad. Replies held in strict confidence. Reply Box 7073, Modern Plastics.

VINYL FINISHER—Offset lithographer seeking finisher to spray and polish 10 pt. rigid vinylite over printing. Reply with full information stating largest sheet size you can handle. Box 7060, Modern Plastics.

LAMINATING AND PRINTING EXPERT NEEDED. Excellent opportunity. Contact Mr. Rudd, Rudd Plastics, Bklyn, N. Y. HY 2-3800.

SUPERINTENDENT — POLY BAG DEPARTMENT — Rare opportunity for experienced man who knows flexographic printing and poly bag converting. A "take-charge" job, carrying full responsibility and authority in an established operating plant. Promising future in rapidly expanding Division. Location in the South. Plastics Division, Chase Bag Company, 355 Lexington Avenue, New York 17, New York.

WANTED: MECHANICAL ENGINEER—To act as Project Engineer in Plastic Coated Fabrics Plant near Boston. Requires B.S.M.E. Degree or equiv. and 2 to 5 years experience preferably in Plastics or Rubber. Send resume to Box 7072, Modern Plastics.

MFRS' REPS.—Producer of sisal fibre materials for the reinforced plastic industry seeks additional representation for several exclusive sales territories. Good income for aggressive representatives with established contacts. Advise territory covered, present principals and products. Standard-Union Fibre Co., 2950 E. Tioga St., Phila. 34, Pa.

SALESMAN WANTED to represent us in Custom Injection Moulding. A. J. Renzi Plastic Corp., 180 Pond St., Leominster, Mass.

CHEMIST-PLASTICS RESEARCH — Supervisory position in modern labs of major electrical mfr. Applicant should possess an advanced degree in chemistry plus considerable experience doing original investigations in the field of polymer chemistry. Plant extrusion experience helpful. Our staff knows of this opening. Reply in confidence stating full details to Box 7068, Modern Plastics.

PLASTICS ENGINEER—Excellent opportunity immediately available with nationally known, multi-plant Chemical Company in very desirable southern location. Requires experience in plastic techniques on sheet, decorative laminates, etc. Must be familiar with design, specifications and installation of production facilities for polyester and vinyl sheets and/or similar plastic products. Initial assignment in the expansion and modernization of existing polyester architectural products plant. Good salary. All replies held in strict confidence. Submit complete resume of education and qualifications to Box 7051, Modern Plastics.

WORKS MANAGER, LOS ANGELES, CALIF. Challenging opportunity for chemical engineer qualified and experienced in management of vinyl extrusion operations. Position also entails responsibility for production of other thermoplastic resins. All replies held in confidence. Send Resume to: Mr. R. T. Hanson, Vice President, Western Operations, The Borden Chemical Company, 603 Norton Building, Seattle 4, Washington.

WANTED—An experienced man to head up Extrusion Department. Good wages, steady work in a going company. South Florida. Box 1445, Hialeah, Fla.

PLASTICS—Chemists and engineers for research and development on polyester, epoxy, urethane and melamine resins. Technical service and sales openings also available for professionally trained personnel with experience in these fields. Send resume to Plastics Div., Reichhold Chemicals, Inc., RCI Bldg., White Plains, N. Y.

UNUSUAL NEW-PRODUCT OPPORTUNITY—New marking and labeling process for vinyl sheet and film needs representation by one now calling on the vinyl trade. Rare opportunity for ground floor start with new, well-financed Co. and non-competitive product. Please state your present activity in reply to: Electrocal, Inc., 105 Chapman St., Canton, Massachusetts.

DISTRICT SALES MANAGER—Plastic or related sales—(corrosion) West Coast experience. Engineering or technical background. Fast growing company expanding to West Coast. Salary, expenses, other benefits. Age 30-45. Send resume to: Employment Manager, P. O. Box 359, Dallas 21, Texas.

INJECTION MOLD SHOP SUPERVISOR Large Eastern plant requires man experienced with large machines; must have ability to administer and supervise personnel. Starting salary $16,000. Write stating background and experience. Box 7067, Modern Plastics.

M.E. OR CH.E.—Experienced engineer to head new vacuum forming operation in established growth company. Should be familiar with equipment and die design, materials, operation and cost estimating. Will work closely with sales. Send complete resume to: Manager of Industrial Relations, National Vulcanized Fibre Company, Wilmington 99, Delaware.

EXPERIENCED BLOW MOLDING ENGINEERS Prime manufacturer of thermoplastic molding compounds requires several engineers to improve and design equipment. Experience in plastic technology essential. Excellent salary positions with one of the leaders in the plastic industry. All resumes treated confidentially. Foster Grant Co., Inc., Leominster, Mass.

TECHNICIAN (Teflon Extrusion) Excellent opportunity for men with experience in extruding or molding. Best working conditions and benefits. Plant located in New York metropolitan area. Send resume & salary requirements to: Box 7063, Modern Plastics.

MANUFACTURERS REP wanted to sell custom thermoplastic extrusions to OEM and general industrial accounts on straight commission basis in New England. Other territories available. Give resume, territory covered and other lines carried. Box 7059, Modern Plastics.

PLASTIC EXTRUSION SPECIALIST wanted by New York metropolitan extrusion house of national reputation. $15,000 & up + bonus for right man with extensive experience in moulding & profile extrusion, tubing, etc. Must be familiar with butyrate, polyethylenes, high impact styrene, PVC. Will also consider less experienced men at salaries commensurate with ability & chance to advance to top position. Will help relocate. Box MP 1393, 125 W. 41 St., NY.

EXTRUSION SALES—Rapidly expanding and technically excellent extruder of precision tubing, custom shapes, seeks Sales Reps or Salesmen to sell quality extrusion. All materials. Must know markets. Write Acadia Plastics, 130 Swalm Street, Westbury, L.I., N.Y.

VINYL ROTOGRAVURE PRINTER — Vinyl Coated Fabrics Company in New England is looking for a man with experience in Rotogravure printing of Vinyl Inks. Salary commensurate with experience. Please submit resume. Reply Box 7077, Modern Plastics.

(Continued on page 274)

(Continued from page 272)

TECHNICAL SUPERVISOR—experienced in polyethylene extruder-laminator operations. Required for new plant being built by major manufacturer in bleached board industry. Excellent growth opportunity. Man selected will help specify equipment and supervise installation, handle start-up, train personnel and supervise operations. A second extruder-laminator and paperboard waxing line are scheduled for near future. Qualifications must include 3-5 years experience in lamination and extrusion. Preferred age under 35. Technical education and additional experience in wax laminating are desired but most important are: actual experience with poly extruder-laminator, proven supervisory skills and imagination. Your reply, which will be kept in complete confidence, should include a personal resume and expected salary and be sent at once to Technical Director, West Virginia Pulp and Paper, Covington, Virginia.

SUPERINTENDENT OR GENERAL FOREMAN wanted by progressive South American coater and laminator. Must have thorough practical experience in production of coated fabrics. Will have full charge of production, plant operation, maintenance. Will also help plan expansion program presently in progress. Excellent living conditions. Write in confidence. David H. Rosenstock, Box 78, East Rutherford, N. J.

WANTED—Project engineer with experience in urethane foam and rotationally molded plastisols for well established plastic molder in Detroit area. Good future for man capable of customer contact on an engineering level with the automotive "Big 3." Reply Box 7081, Modern Plastics.

WIRE & CABLE PLANT MANAGER—We want a man with plastic extrusion experience to run a large New Jersey insulation plant; work includes scheduling, foreman supervision, production evaluation; general problems of plastic extrusion and copper wire drawing. This is a growth opportunity for alert, aggressive imaginative man. Write stating experience and salary requirements. Box 7074, Modern Plastics.

VINYL CHEMIST—New England manufacturer has an opening in the laboratory for a chemist with experience in compounding, for vinyl coated fabrics, either base compounds or finishes. Excellent company benefits. Reply Box 7078, and include resume.

WANTED—Project engineer or supervisor with profile extrusion experience to take charge of extrusion department as well as customer contact in established Detroit area plastic plant. Good solid future for a man with proven experience. Reply Box 7082, Modern Plastics.

BLOW MOLDING—Production Mgr. sought by well financed company to manage new bottle blow molding operation. Unusual, ground floor, growth opportunity. Reply Box 7076, Modern Plastics.

MFRS' REPS.—Leading producer of color concentrates for the plastic industry seeks additional representation for exclusive sales territories. Exclusive products backed by top merchandising program will yield lucrative income to aggressive personnel with established contacts. Advise territory covered, present principals and products. Pleasant Industrial Chemicals, Inc., 270 Lincoln Blvd., Middlesex, N. J.

ENGINEER EXTRUSION SHRINK-DOWN MATERIAL—Eastern progressive company with vigorous product development program seeking mechanical engineer with heavy experience in development and formulation of shrink-down material. His function may also include general development of production equipment and/or processing techniques in the field of coating of electrical tubing. Reply Box 7086, Modern Plastics.

PLASTIC COMPOUND SALESMAN—Growth Co. seeks person expd. with buying & selling virgin & reprocessed vinyl. State experience, salary. Box 7075, Modern Plastics.

PLASTIC TECHNICIAN — VACUUM FORMING—NYC firm offers excellent opportunity to experienced technician or product design engineer. Complete knowledge in all phases of thermoforming required with supervisory background. Will join our management team with salary, incentive bonus plan and executive insurance program. All replies confidential. Box 7089, Modern Plastics.

DEVELOPMENT ENGINEER-PLASTICS To do product design, development and valuation of small thermoplastic parts. This includes the fabrication of models for evaluation. Basic knowledge of thermoplastics, injection molding and die design. Mechanical Engineer background preferred. Send resume to: Richard Cordell, Personnel Department, Abbott Laboratories, North Chicago, Illinois. An equal opportunity employer.

DECORATIVE PLASTIC SALES MANAGER—Leading manufacturer of decorative plastics seeking outstanding sales director with history of National accomplishment. Please submit complete resume. Reply Box 7090, Modern Plastics.

Situations Wanted

PLASTICS ENGINEER, M. S. DEGREE. Ten years first-hand experience with thermoplastics including extrusion of film, sheet, profiles. Also development, compounding, scrap reclaiming. Full knowledge die and machine design. Production, management, and sales background. Desires rewarding position with a challenge. Reply Box 7054, Modern Plastics.

PLASTICS ENGINEER—6 years experience in all phases of extrusion and orientation. 11 years overall experience in varied Chemical processes. Very successful development and production record. Reply Box 7053, Modern Plastics.

YOUNG EXECUTIVE, 10 years experience in Fiberglass & Allied Plastics, extensive Sales, Production & Technical Background, desires change. College Graduate, married, will relocate. Reply Box 7056, Modern Plastics.

I CAN SELL! Point of sale. Packaging—Premiums. Plastics. Seasoned executive with a thorough knowledge of all plastic and printing processes. For the best representation in the metropolitan N. Y. area write to Box 7057, Modern Plastics.

INJECTION MOLDING, MANAGEMENT ASSISTANT, excellent background in cost estimating, purchasing and production control. Capable of taking entire job from estimate through part and mold design and into production. Desires permanent position having growth potential, with New York City custom or proprietary molder. Reply Box 7069, Modern Plastics.

SALES REPRESENTATIVE, calling on the Lamp & Lighting Fixture Industry, in New York, and Penn. area, is looking for a line of plastic Lamp Parts, or plastic parts, that can be utilized, in the assembling of complete and finished units. Reply Box 7070, Modern Plastics.

PLASTIC MACHINERY—Design Engineer with proven successful record in design of blow molders, screw extruders and screw plasticizers will custom design to your specification. Preferably on a project basis. Reply Box 7071, Modern Plastics.

SALES MANAGER—Experienced in all phases of advertising & promotion, trade shows, exhibits & direct mail. Sales-team recruitment and supervision success. Good industrial experience. Hard working, mature. Seeking good growth potential. Available immediately. Box 7079, Modern Plastics.

MANUFACTURERS REPRESENTATIVE with 15 yrs. experience in plastic and packaging sales is interested in an additional line. Will only consider a company with some established business or an unusual potential, serving major industry. We maintain a two man sales office covering Chicago and surrounding area. Sound financial and business references. Reply Box 7091, Modern Plastics.

Business Opportunities

WELL ESTABLISHED CANADIAN PROPRIETORY INJECTION MOLDER—has a large plant equipped with modern molding machines, is interested in establishing an additional company on a partnership basis with American Plastic Manufacturer of Proprietory Lines. Reply Box 7052, Modern Plastics.

WANT TO BUY—Injection Molding plant making small parts and closures state full details including number of machines. R.M.A., P. O. Box 25, Ellenville, New York.

AMERICAN KNOW-HOW — EUROPEAN CRAFTSMANSHIP teamed to produce quality compression, injection and blow molds. Open capacity and complete services from mold engineering to testing available through American firm in Europe. Contact: MII Technical Products Division, 363 Putzbrunner Strasse, Munich 67, West Germany.

WANT TO GO IN BUSINESS?—Will finance plastic proposition of merit. Write Box 7062, Modern Plastics.

RAPIDLY GROWING—Packaging and Plastics machinery sales agency covering New York and Pennsylvania can do justice to one additional well accepted high volume line. If proven record of creative selling, heavy technical background, and wide knowledge of packaging equipment and materials can help your marketing program, Write Box 7066, Modern Plastics.

YOU'RE WASTING $25,000! That's what our non-profit development corporation paid for a survey to determine what kind of industry we are best equipped to serve. The survey by the nation's outstanding consulting firm discovered five competitive advantages vital to paper and plastic manufacturers. So, you're wasting $25,000 worth of research, vital to you, until you write for your confidential copy of this report to . . . Box 7088, Modern Plastics.

WANTED TO PURCHASE or merge plastic injection molding plant. Location: Long Island. Write details. Box 7087, Modern Plastics.

RATES FOR CLASSIFIED ADVERTISING

All classified advertisements payable in advance of publication

Closing date: 10th of preceding month, e.g., Dec. 10th for Jan. issue
Per inch (or fraction) . . . $30.00; each 3 inches or fraction (in border) $15.00 extra

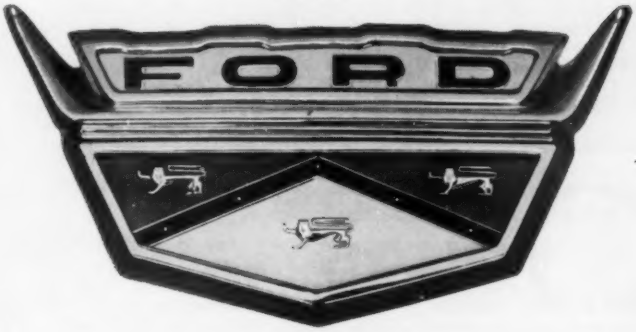
Situations Wanted Ads . . . 1/3 of above rates

For purposes of establishing rate, figure approximately 50-55 words per inch. For further information address Classified Advertising Department, Modern Plastics, 770 Lexington Ave., N. Y. 21, N. Y. Modern Plastics reserves the right to accept, reject or censor classified copy.

INDEX OF ADVERTISERS

Distribution of this issue: 40,700 **November 1961**

(Continued on page 278)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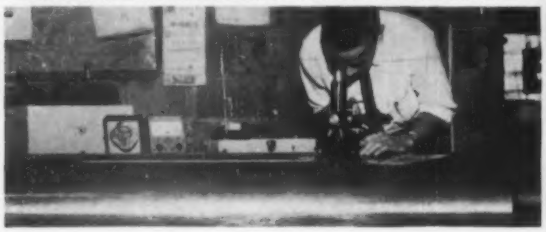
(*Continued from page 276*)

MODERN PLASTICS

PUBLISHED BY BRESKIN PUBLICATIONS INC. 770 Lexington Avenue, New York 21, N. Y.

MEASURING SURFACE FINISH OF CHROMIUM PLATED STEEL COOLING DRUM (40" DIAMETER).

INSPECTING SURFACE CONDITION WITH GRAVURE MICROSCOPE.



LARGEST EQUIPMENT . . .
SMALLEST MEASUREMENTS

In the paper and plastic industries, continuous production often depends on the smoothness and durability of surfaces of huge rolls and drums used in forming and finishing mile after mile of paper, film or foil. The finish of this equipment is reflected in the finish of the end product.

Chromium provides the durability and surface hardness necessary but the exact degree of smoothness can only be provided by years of experience, backed up by the best precision grinding and polishing equipment available, and meticulous quality control with instruments that measure in the millionths.

All of these elements are applied by U. S. Metal Coatings Company in achieving surface finishes as low as one micro-inch on rolls and drums weighing up to five tons.

Phone or write for expert consultation and specific recommendations.

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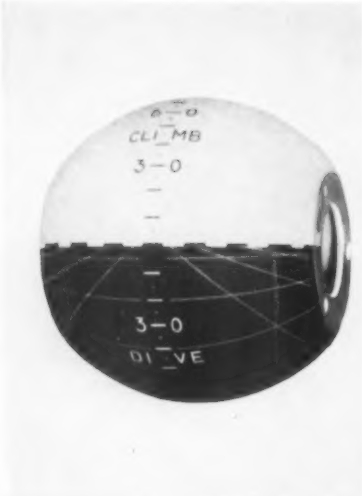
G-E LEXAN® POLYCARBONATE RESIN

GOOD DIELECTRIC—AND MUCH MORE!

STABLE ELECTRICALS. Binding posts made of LEXAN resin retain electricals even under moist, hot conditions. They do not loosen, are molded in six attractive LEXAN colors for coding. Other features are: low loss and power factor, low dielectric constant, high voltage insulation, non-sink surfaces.
(Superior Electric)

HEAT RESISTANCE. Beautiful handles of LEXAN polycarbonate resin are used in rugged service on U.L. approved soldering irons. They resist the impact, heat and abrasion of daily bench work. The hard, glossy handles are light in weight. Molded in three pastel colors, they provide toughness and sales appeal.
(Ungar Electric Tools)

TRANSPARENCY of LEXAN resin is important in chart guide for recorder. LEXAN resin is the only transparent plastic able to withstand heat generated by internal lights. It is distortion-free at temperatures up to 270°F and self-extinguishing. Its extremely high impact strength eliminates cracking of guides.
(The Foxboro Co.)



DIMENSIONAL STABILITY. Maximum allowable change in this 5-inch aircraft instrument part is only 5 mils over a temperature range of —65° to 300°F! And it must maintain this tolerance under high humidity. Part is injection molded of LEXAN resin as half spheres which are solvent cemented, lathe-turned and painted. (Lear, Inc.)

TOUGHNESS. Press-fitted into metal gear used in an electric drill, bushing of LEXAN polycarbonate resin provides safety from electric shock . . . helps eliminate need for additional grounding. Strength and creep resistance of LEXAN resin enables bushing to withstand torque and load requirements of drill.
(Millers Falls Co.)

ARE YOU LOOKING FOR A PLASTIC THAT CAN REALLY TAKE IT?

To demonstrate the toughness of LEXAN resin, salesmen will sometimes slam and hammer a product made of the material. LEXAN has the highest impact strength of any plastic – amounting to 12-16 foot-pounds per inch of notch – and it usually emerges unscathed from encounters with such "merchandising stresses". It is a high-performance material, likewise, with regard to high-temperature behavior and dimensional stability.

Its many other advantages make it a priority material for thorough investigation by all designers, engineers and molders. We will be pleased to supply you with information on the properties, processing and end-uses of LEXAN resin. Don't hesitate to write to us. General Electric, Chemical Materials Department, Section MP-111, Pittsfield, Mass.

LEXAN®
Polycarbonate Resin

GENERAL ELECTRIC